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AGRICULTURAL NEWS

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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The Educational Functions of Agricultural Departments.

THE work of disseminating knowledge on agricultural subjects is a most important part of the functions of departments of agriculture. This is done by publications of different kinds, with varying aims, and intended to meet the needs of many different readers. But doubtless it very often happens, in spite of all efforts to meet his needs, that a reader of the publications of an agricultural department becomes somewhat disappointed in not finding the thing that he specially wants at the time. It is rather unreasonable for readers of such publications to feel, that because each number does not happen to supply just the kind of information wanted at the moment, they are not fulfilling their purpose. Such a frame of mind results from overlooking the fundamental fact that the publications of a scientific department are meant to be educational in the broadest sense.

In any system of education, the mere imparting of a certain number of facts, or the endeavour to instruct for a special purpose or for a particular object, is rightly condemned as mere cramming. Education must be a leading up to an adequate appreciation of principles, based of course on particular facts, but conducing to a broad and generous outlook. This has to be especially the aim of the instructor in agricultural science. So the aim of the Imperial Department in its publications has consistently been, not only to give information about isolated facts or processes, but also to place those facts or processes in their true relation to agricultural principles. For this reason the publications of the Department are, in some measure, meant to form a series. The remarkable progress which the science of agriculture has made in the last thirty or forty years rendered it necessary in the interests of the planter or farmer, that he be enabled to refer without difficulty to the results obtained by the men who have devoted their attention to the elucidation of questions connected with his business.

So the *Agricultural News* is designed to supply, in a popular form, items of information on agricultural subjects, which seem to meet the requirements, or to advance the interests of those interested in the agriculture of the West Indies. For this purpose extracts are made in its pages from the latest publications relating to agriculture, and hints, or even instructions are given with reference to the cultivation of various crops, or with reference to other

subjects with which the planter is concerned. The regular reader of the *Agricultural News* will doubtless find, from time to time, some notice of the point on which he is looking for information, and almost certainly, references to authorities on the subject.

Then there comes in the Pamphlet Series. These Pamphlets are issued by the Department as compendiums of knowledge on various matters of standing importance connected with West Indian agriculture; they are written or compiled by men with scientific acquaintance of the subjects of which they treat; and as far as possible they are expressed in language which avoids unnecessary technicalities. Should the planter wish to study more deeply the scientific aspects of any question, the articles contributed to the *West Indian Bulletin* deal with this side of agriculture and kindred topics, especially in relation to this part of the world. However, as the publications referred to above cannot pretend to be a comprehensive encyclopedia, it may occur that the seeker after knowledge is still unable to find what he wants.

The best course then is, first to refer to the officers of the Agricultural Department of the island or colony in which he may happen to reside; they probably will be able to point out to him the source from which he may gather the desired information, or in case of their inability to do so on the spot, refer for further information to the Head Office of the Imperial Department. And even then, should the specialists of that Office be unable to elucidate the point, they can refer to the best authorities in the world for information of the highest value, and of most recent date, which they will be glad to communicate for the guidance of any investigator, either as regards books to be consulted, or any other necessary light on the subject.

So much for the position of agricultural departments as to their work in disseminating agricultural knowledge, and as to their ability to do so. But there is the other side of the question. The agriculturist in the West Indies, as in all other countries, must do his share of the work, and that is by making use of agricultural publications, and by asking questions, whenever he finds himself at a loss for information, from the authorities. It is futile for a man to feel dissatisfied with not finding what he wants in the publications or books to which he may have access, when, by asking a question in the proper quarter, he can almost certainly receive the desired information. Throughout the world, and very noticeably in the United States, the value of the publications of agricultural departments in their educational aspect is becoming more and more realized. Vast sums of money are spent without hesitation on this portion of the work of the departments, because the farmers recognize that in the progressive science of agriculture there is no standing still, and that there is something new for them to learn every year, which concerns their business as vitally as the invention of the latest explosive conerns the art of war. They must learn these new things, if they are to continue to be good farmers. This is also true of the planter in the Tropics. He must keep abreast of the knowledge of the time.

If the work of the agricultural departments consisted merely in telling planters how to do what they have been doing themselves for years, the need or use of them would soon cease to exist. But they aim to do more; they aim to teach planters to think and reason for themselves; and this they endeavour to effect by means of their publications, which bring to the notice of the planter new thoughts, new results, new methods, which they must examine, reflect upon, and experiment with for themselves.

The day is past when it was considered that very little education and practically no reading was required for a planter. Agriculture is now recognized as a science which needs the best educated men, and needs the continual application of education to the solution of its problems by those who practise it. In this way the profession of agriculture is elevated from mere drudgery, as a means of making a livelihood, to its proper position, as an occupation capable of employing the highest intellectual powers of any man, and of affording his intellect continual pleasure and satisfaction.

SUGAR INDUSTRY.

ABSTRACTS OF PAPERS READ AT INTERNATIONAL CONGRESS.

Mr. W. R. Dunlop, Scientific Assistant to the Imperial Department of Agriculture, at present in London, has forwarded the following abstracts of papers dealing with sugar, read at the International Congress, London, 1914:—

THE SUGAR-CANE IN INDIA. By C. A. Barber, D.Sc.

In discussing the central factory question in regard to India, the writer says the want of success has been due to several causes. The class of factory and kind of machinery may not have been those best suited for the thin North Indian canes. Local conditions of land tenure, the supply of canes to the factory, or the quality of the Jaggery or gur made, were probably not sufficiently considered. Dr. Barber thought there was great scope for research in connexion with the central factory system in North India, where a taste for white sugar is rapidly growing stronger.

CLASSIFICATION OF SUGAR-CANE. By C. A. Barber, D.Sc.

The writer has been making interesting observations on Indian canes, chiefly in connexion with morphological charac-

teristics like erectness, bending of the leaves, thickness of the leaves, stems, tillering, colouring of the stems, and the like. The writer does not attach much value to colouring as a means of differentiation for Indian canes, in spite of this being an important factor of determination in the West Indies. An interesting point brought out is that which refers to the circlet of hairs on the leaf scars of varieties of Indian canes. Dr. Barber has found this a useful characteristic, in classifying Indian canes, but the character does not occur much on tropical canes, though it has been noticed on at least one Barbados seedling. This circlet of hairs seems to be a 'primitive' characteristic appearing only in the most primitive forms of sugar-cane.

Dr. Barber attaches much value for classification to the bud, and especially to the bursting of the bud.

SUGAR PRODUCTION IN THE NORTH WEST FRONTIER PROVINCE, INDIA. By W. R. Brown and J. Walter Leather.

This paper contains interesting evidence to show that harvested cane in northern India, which is stored whole in clamps, like mangolds are in England, does not deteriorate as regards inversion as one would expect. This seems to be explained by the low temperature, which is about 50°F. Efforts are being made to extend beet cultivation in this part of India.

SUGAR DUTIES IN CANADA.

In the last number of the *Agricultural News* (Vol. XIII, p. 407) mention is made of the effect of the change in the Dutch Colour Standard for raw sugars in the Canadian market. In further consideration of the subject the following information may be of interest.

The Dutch Standard No. 16, in use by the Canadian Customs Authorities, is stated to be darker than the No. 16 of previous years, in fact it is stated to be about the same as the No. 14 of previous years, and this would make a great difference in the amount of duty to be paid on certain raw sugars, especially those of a light colour and a low test by the polariscope.

According to the schedule, which has now become law, presented in the Budget Speech of the Hon. W. T. White, M.P., Minister of Finance, in the Canadian House of Commons on August 20 last, on all sugars above No. 16 Dutch Standard in colour, and all refined sugars of whatever kinds, grades or standards, testing not more than 88 degrees by the polariscope, the duty shall be $1·52 per 100 lb. under the British Preferential Tariff, and for each additional degree over 88 the additional duty shall be one cent per 100 lb.

Sugar not otherwise provided for, not above No. 16 Dutch Colour Standard, and molasses testing over 56° and not more than 75° by the polariscope, pays duty at the rate of 88c. per 100 lb., and for each additional degree over 75° the additional duty is 3c. per 100 lb.

The following table shows the duties payable on 100 lb. raw sugar under the present and the old tariffs, both British preferential and general. In order to save space the figures are not given for each degree: for the higher colour standards the figures by even numbers from 88 to 100 degrees are given, whilst in the table under the lower standards the figures start from 75 degrees, and are given at each additional five degrees to 100.

ABOVE NUMBER 16 DUTCH STANDARD.

Degrees Polariscope.	Present tariff. British Preferential.	Present tariff. General.	Old tariff. British Preferential.	Old tariff. General.
	$ c.	$ c.	$ c.	$ c.
100	1 64	2 08	84	1 08
98	1 62	2 05⅓	82	1 05⅓
96	1 60	2 03⅔	80	1 03⅔
94	1 58	2 01	78	1 01
92	1 56	1 98⅓	76	98⅓
90	1 54	1 95⅔	74	95⅔
88	1 52	1 93	72	93

The preferential tariff is thus increased under this colour standard by 80 cents, the general by $1·00.

NUMBER 16, OR BELOW 16, DUTCH STANDARD.

Degrees Polariscope.	Present tariff. British Preferential.	Present tariff. General.	Old tariff. British Preferential.	Old tariff. General.
	$ c.	$ c.	$ c.	$ c.
100	1 06¾	1 42½	43¾	62½
95	1 03	1 36¼	36¼	56¼
90	99¼	1 30	32½	50
85	95½	1 23¾	28¾	43¾
80	91¾	1 17½	25	37½
75	88	1 11¼		31¼

The preferential tariff is thus increased under this colour standard by 63 cents, the general by 80 cents.

MILL WORK IN JAVA.

The Imperial Department has received a communication detailing the facts relating to sugar milling in Java, in the year 1913. The following table of the mean results obtained on 129 factories will doubtless be of interest:—

Cane sucrose per cent.	12·54
Fibre „ „	12·40
Bagasse sucrose per cent.	4·45
Moisture „ „	46·52
Fibre „ „	47·66
Sucrose in bagasse per cent. on cane	1·16
Juice of first mill: Brix per cent.	18·72
Sucrose „ „	15·51
Purity „ „	82·85
Juice of final mill: Brix „ „	7·85
Sucrose „ „	6·00
Purity „ „	76·43
Mixed juice: Brix „ „	16·43
Sucrose „ „	13·30
Purity „ „	80·95
Maceration water on 100 parts normal juice	13·9
In mixed juice contained sucrose on 100 cane	11·38
Normal juice in bagasse on 100 fibre corrected for variation in sucrose and fibre in the cane*	57·9
Juice extracted on 100 parts of juice in cane	90·7

* Ditto uncorrected (Lely factor) 60·2.

SWEET POTATOES.

Sweet potatoes probably contribute a larger part to the food of the great mass of the people living in the smaller West Indian islands, than any other one article. From several of the islands there is information of a larger area being put under this crop this year. In view therefore of these facts the following may be of interest.

The sweet potato (*Ipomoea Batatas*) is a native of the Tropics, its original habitat being probably the West Indies, or Central America. It is now largely grown in the tropical and subtropical regions of both hemispheres.

The soil best suited to the cultivation of the sweet potato is a moderately fertile, sandy loam. Its requirements are, however, modest, for a fairly good crop can be grown on soils that are too poor for the production of most roots or cereals, especially when sweet potatoes are used in rotation with leguminous crops. With the potato, as with other crops, judicious rotation conduces to success. Good drainage is essential. Probably one of the reasons for the very general planting of sweet potatoes on ridges is to secure better drainage.

Well rotted stable or pen manure is to be recommended for use with the sweet potato. Too heavy applications of manure to the land, shortly before planting, tend to stimulate the growth of the vines at the expense of the roots. Probably, the best course to pursue is to manure thoroughly the previous rotation crop, so that the manure may be somewhat reduced before the sweet potatoes are planted. As it has been proved that they need also a good supply of potash, the use of wood or vegetable ashes along with the pen manure will be of advantage. To obtain good results on soils deficient in lime, this should be liberally applied, preferably some months before planting.

In the West Indies sweet potatoes are grown almost universally from cuttings, though the small tubers that are now used as food for hogs might be employed for that purpose. Reference to this point will be made further on.

The varieties of sweet potato are numerous. Very useful work has been done in the different experiment stations of the Departments of Agriculture in these islands with regard to varieties, their yield, their characteristics, their adaptability to local conditions. Anyone desiring information on these points should consult the annual reports of these stations, or preferably refer to the agricultural officers in charge of them.

The sweet potato does not usually keep well when stored, at least in the West Indies. This is probably attributable in some degree to carelessness in harvesting the crop, and to want of proper storehouses. *Farmers' Bulletin*, No. 520, issued by the United States Department of Agriculture, on the storage and marketing of sweet potatoes, gives advice on this point, which, allowance being made for different climatic conditions, should prove useful to the West Indian grower. The following is an abstract of the directions in the above mentioned bulletin as to harvesting the crop. The first point to be considered is, that if the sweet potatoes are to be stored, they must not be reaped until they are fully ripe. *Farmers' Bulletin*, No. 548, with reference to this, gives the following test of ripeness: 'Farmers can judge when sweet potatoes are ripe, by breaking or cutting the tubers, and leaving them exposed to the air for a few minutes. If the cut or broken surface dries, they are mature, but if the surface remains moist, they are not ready to be dug.' The most important factor in keeping sweet potatoes is careful handling. They should be dug without cutting or bruising the tubers. If possible, the digging should be done on a bright sunshiny day, so that the potatoes may lie exposed to the sun and the wind for a couple of hours before being taken to the storehouse. In harvesting and storing, sweet potatoes ought to be handled as carefully as if they were eggs. Before storing they should be graded, the main object being to separate from those intended to be stored for any period, all the cut, broken, or bruised roots, as well as those that are extremely large, or too small.

With regard to storehouses, the bulletin says that a dry room, well ventilated, with an equable temperature of from 80° to 85° F. is requisite. The best results are obtained by placing the potatoes in bins. These are constructed of 2 by 4 inch scantlings, placed on the floor as sleepers, and a bottom of 1 by 4 inch slats nailed on them, leaving $\frac{1}{2}$-inch spaces between the slats. The sides of the bins are made by setting the same sized scantling, of the height required, upright, and nailing the same sized slats to them, only the space between may be 1 inch. A space of at least 6 inches should be left between the bins, and also between the bins and the wall of the house, to ensure ventilation and a free circulation of air. A good size of bin is $6 \times 10 \times 10$ feet.

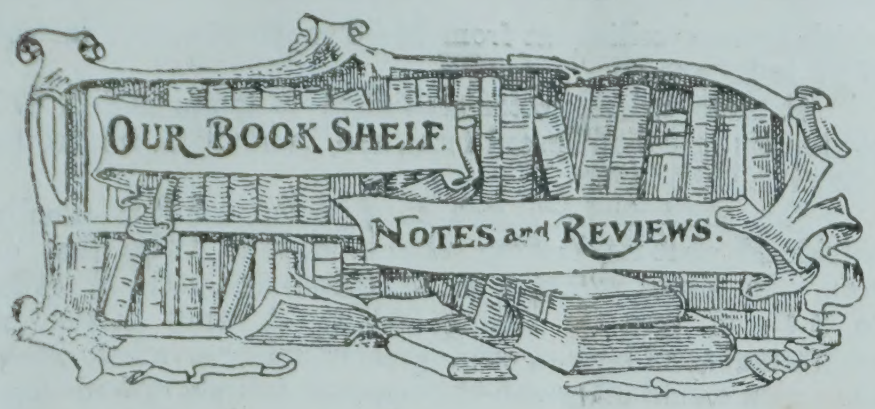
In storing the potatoes in the bins, care in handling is again emphasized. When the potatoes are brought from the field they should be placed in a layer about 2 feet deep over the floor of the bins. As a rule, it is well to allow this layer to dry for a day or two before a second is put in. In order to carry the second layer to the back of a large bin without walking on the first layer, and so bruising them, a few bags filled with straw are thrown on the potatoes, and on these planks are placed for the workmen to walk on. After a day or two a third layer is added, the depth of potatoes being about 6 feet when the bin is filled. No straw or other material is placed between the layers.

The potatoes thus stored give off a quantity of moisture. A week or ten days is required to cure them properly. One test of curing is the ease or difficulty with which the skin of the potato can be scraped off. As long as it can be easily removed the curing process is not complete. The main thing after this is to keep the roots perfectly dry, and well ventilated.

Increased production of sweet potatoes might lead to an export trade. There is already some export of this crop from Barbados to some of the other islands and to Demerara; but there seems to be a possibility of there being a remunerative market for sweet potatoes in Canada, where climatic conditions forbid the cultivation of them. Here emphasis must be again laid upon the necessity of careful grading and packing. Each package, barrel, or box should contain tubers of uniform size, shape, and variety. To cram indiscriminately into one package, big and little, round and long, red and white, dry and moist potatoes, means poor value in the market.

In the first place, experiments would have to be made as to the best keeping varieties of potatoes, and then as to the size, shape, colour, etc., most likely to be acceptable in the market. Probably a medium sized potato, of a somewhat long, oval shape, would be found to be the most attractive. Barrels with ventilating spaces provided in the staves would be about the most convenient packages to use for shipping. These should be carefully packed, so as to avoid crushing and bruising the potatoes.

In this connexion it may be remarked that according to *Farmers' Bulletin*, No. 324, of the United States Department of Agriculture, if the small tubers mentioned above are used for planting, it is well to select them of uniform size and of the shape desired in the next year's crop



THE COCO-NUT. By Edward Bingham Copeland, Professor of Plant Physiology and Dean of the College of Agriculture, University of the Philippines: *Macmillan & Co., 8vo., 212 + XIV pp.* Price 10*s.* net.

A good deal of the recent literature of the coco-nut has been produced with more enthusiasm than sound knowledge, and the prospective planter who has been inspired by the exponents of the 'next great boom' would do well, when he comes to start operations, to turn to a book in which agricultural practice is considered in the light of scientific enquiry, and business considerations in the light of common sense.

The manual before us has been written in correlation with courses of instruction on the subject, given by the author in the University of the Philippines, and has been amplified and substantiated by the experiments and observations of the students in successive classes. We hasten to add that it is far from being academic, in the derogatory sense of that word, and that while there is a certain amount of local colour in the descriptions, the information given is capable of quite general application.

The physiology of the different organs of the coco-nut plant is first considered, with a view to bringing out any special adaptations the tree may possess, and any special conditions it may require. It is shown to be not so individual in its needs or tolerances when compared with other plants as is sometimes supposed. Several questions of very practical importance, such as the nature of the root system, the influence of shade on transpiration and growth, and the relation between rate of growth and production of fruit are discussed from exact data.

With regard to suitable soils and situations, the author discredits the common idea that salt is necessary for the full development of the tree. He points out that the sandy beaches where it thrives are, as a matter of fact, quite as free from salt as ordinary soils, except in the event of an inundation from the sea. Like other sea-shore plants, the coco-nut is adapted to withstand the effects of such occurrences, but derives no positive advantage from them. That the tree is able to thrive in almost pure sand is attributed to the supply of food contained in the seepage water from the lands behind the beach, which bathes the roots on its way to the sea. The belief current in the West Indies, as elsewhere, that coco-nuts like plenty of water in the soil so long as it is not stagnant, may be explained on these lines. Porous soils situated around the bases of mountains, especially of volcanoes, afford somewhat similar conditions, and are regarded as highly favourable to this crop. Consideration of the possibilities of the transport of food materials in underground water still further discredits soil analysis as an index of fertility.

A very adequate summary is given of our present knowledge on the subject of the diseases and pests of the coco-nut palm, some eighty pages being taken up with their consideration. The author's remark that 'knowledge of the nature of pests and of the mischief they do, or even of methods of combating them, is not of great value unless it is applied,' is as necessary as it is obvious.

In the chapter on selection and treatment of seed, it is pointed out that while the existence of a large number of varieties, races, and strains, and the occurrence of considerable variation give very wide scope for selection, too little is known of the comparative values of the different types to enable very much advantage to be taken at present of their existence. The fallacy of the common practice of nut selection, as distinguished from tree selection, is emphasized.

The directions for nursery work, and the chapter on field culture contain fully reasoned advice on these subjects in all their details. The final chapter appears to deal adequately with the nature and preparation of coco-nut products. A full index is appended.

The book can be warmly recommended to planters and agricultural officers. To the latter, it will suggest useful lines which further investigation may follow.

Coco-nut Meal and Gluten Feed.—The coco-nut meal used in animal feeding consists of the dried and ground flesh of the coco-nut from which the oil has been extracted. The particular sample used in this experiment had the following composition (per cent.): Water 9·00, protein 19·35, carbohydrates 48·00, fat 9·12, fibre 8·64, and ash 5·89, so that it contained rather less protein and fibre, and more carbohydrates than the average of German samples. The food chosen for comparison was gluten feed, and this contained less ash and fat, rather more protein, and decidedly more carbohydrates than the coco-nut meal.

Digestibility experiments with sheep showed the following amounts in lb., to be digestible out of 2,000 lb:—

	Coco-nut meal.	Gluten feed.
Protein	347·6	397·2
Carbohydrates	829·0	946·6
Fat	187·4	46·6
Fibre	40·4	118·6
Ash	75·4	65·5
Total indigestible matter	1,479·8	1,578·5

If the fat is converted into its starch equivalent the coco-nut meal would seem to furnish 1,705 lb., and the gluten feed 1,634 lb. of digestible matter per 2,000 lb. fed.

Ten cows were selected, and the comparative value of the two foods for milk production was ascertained. The basal ration consisted of hay and bran, five cows being fed on coco-nut meal and five on gluten feed, these two foods afterwards being changed over; both foods were fed at the rate of 3·68 lb. per head per day. Substantially the same amounts of milk were obtained from the coco-nut meal, as from the gluten feed, but slightly more butter fat was secured from the former.

It is believed that coco-nut meal is fully equal to gluten feed in nutritive value, although it is doubtful if it exceeds it. German observers consider it particularly desirable for dairy animals, in amounts of from 3 to 4 lb. per head daily, and it has been shown to increase somewhat the fat content of the milk. Fed in excess of 4 lb. it is held to make too hard a butter. (The *Journal of the Board of Agriculture*, November 1914.)

COTTON.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended December 5, is as follows:—

The demand continues for the limited offerings of odd bags on a basis of our quotations, the buying being largely on account of the Northern Mills, who are attracted by the prices ruling for Fully Fine and Fine, which look relatively cheap in comparison with prices paid for Floridas and Georgias. The exports for the week were 208 bales to Northern Mills.

The crop continues to move to market slowly, the receipts to date being only 1,517 bales against 3,728 bales last year.

The Planters' crop lots are held at 30c. to 35c., which is much above the views of buyers.

We quote, viz:—

Extra Fine	23c. =	13½*d.*,	c.i.f. & 5 per cent.
Fully Fine	20c. to 21c. = 12*d.*	to 12½*d.*,	,, ,, ,, ,,
Fine	18c. = 11*d.*		,, ,, ,, ,,
Fine off in colour	17c. = 10½*d.*		,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to December 5, 1914, were nil, 260 bales, and nil respectively.

COTTON-SEED MEAL AS A FEED.

The accompanying article, taken from *Modern Farming*, shows that in the Uuited States there is a likelihood that low prices for cotton seed will prevail during the coming year, and indicates the profit which may be expected to result from feeding cotton-seed meal to farm animals, especially when the object is beef for slaughter.

The use of cotton-seed meal instead of linseed as a high proteid food is known to West Indian planters, and it is used to a considerable extent for feeding purposes. The figures given herewith should be of interest:—

The estimated 15,000,000 bale crop of cotton should yield 6,680,000 tons of seed. All of this, of course, will not be crushed, but if last year's proportion holds good again, about 2,000,000 tons of cotton-seed meal will be available. Last year approximately 400,000 tons were sent abroad. Under present conditions it is not probable that anything like this quantity will be exported this year, and, as the cotton crop is larger than before, it is safe to assume that the quantity of cotton-seed meal on the home market will be 500,000 tons more than last year. The situation has already resulted in a substantial drop in the price of cotton seed by-products. Cotton-seed meal can now be bought in the South at prices ranging from $22 to $24 per ton, instead of $27 to $31 demanded last year. An even greater decrease has taken place in the price of cotton seed hulls, which are now selling at from $4·50 to $5·50 a ton, instead of $7 to $9 a ton.

At these prices, cotton-seed meal is approximately $15 per ton cheaper than linseed meal, and, in addition, its feeding value is a trifle higher.

This meal is very rich in protein, and it is usually considered that its feeding value is at least twice that of corn. In other words, 1 lb. of cotton-seed meal is equal to 2 lb. of corn for feeding cattle. A small portion of cotton-seed meal has an even greater relative value where the ration would otherwise be composed entirely of feeds high in carbohydrates, such as corn, corn stover, and timothy hay. This is extremely important to cattle feeders throughout the corn belt, and other States where much corn is fed. In Indiana, for example, it was found that the addition of 1 lb. of cotton-seed meal to a ration of corn and clover hay resulted in a saving of 1·37 lb. of corn and 1·41 lb. of clover hay. This means that if corn was worth 70c. a bushel, and clover hay $15 a ton, each ton of cotton-seed meal fed the cattle saved the farmer $55·40 worth of other feed. With cotton-seed meal at $24 a ton, this is a net saving of $31·40—a saving well worth while.

COTTON-SEED MEAL AND BEEF SCRAP AS FOODS FOR CHICKENS.

Eight experiments were carried out to compare cotton-seed meal and beef scrap as protein foods for chickens. These two foods were fed in most cases in such quantities that their nitrogen content was the same. The basal rations fed were so deficient in protein that a considerable amount could be added in the foods under trial, without supplying enough for the maximum growth of the chickens. Under such conditions the amount of protein would be the main factor influencing growth. Further, the non-protein constituents of the foods were usually in such liberal amounts that the protein was probably mainly efficient as a source of nitrogen rather than of energy.

It was shown that for the growth of young chickens it is more important, within reasonable limits, for the amount of protein to be sufficient, than for it to be associated with a definite proportion of carbohydrates and fat (i.e., than for there to be a definite nutritive ration).

In certain of the experiments the chickens were cooked, after preparation in the usual way, and the amount of water, ash, protein, and fat determined, not only in the bones, but also in the meat and soup. Between the ages of about four to fifteen weeks, the chickens retained in the cooked portion about 18 per cent. of the nitrogen consumed in the rations of medium protein content, in which case there was no unnecessary waste of nitrogen.

There was, if anything, a larger gain in live weight per gramme of nitrogen fed in the case of beef scrap than in that of cotton-seed meal.

If the constituents of bone are supplied, there appears to be no reason why cotton-seed meal may not be used to furnish a considerable portion of the protein required by chickens, especially if a moderate growth is satisfactory to the feeder. If the most rapid growth is desired, regardless of the amount of food consumed, beef scrap, it is stated, will be found more satisfactory, since in these experiments the chickens consumed more of the beef scrap ration when allowed to have all they would eat, and made a more rapid growth in consequence.

No toxic effect was found to result from the feeding of cotton-seed meal. (The *Journal of the Board of Agriculture*, November 1914.)

INDIAN CORN.

TESTING THE GERMINATION OF SEED CORN.

In the last number of the *Agricultural News* the notes on Indian Corn had to do with the care of Seed Corn. It was there pointed out that the Indian corn plant produces seed of exceptional vitality and germinating power. In the case of corn which has been properly grown, ripened, and stored, every kernel should grow, and consequently it is necessary to produce good seed corn, and to preserve its vitality, rather than attempt to choose out of a mass of ordinary corn a certain number of ears which may be used to supply the seed for the next crop. Seed corn must be harvested as seed corn, and stored as seed corn, not merely as corn, in order to produce satisfactory results. It should be remembered also that it is not enough for seed corn to possess good germinating powers: it must also represent good production.

The germinating power is of much importance, however, and in order that West Indian planters may be in a position to make satisfactory tests if they desire to do so, the following is reproduced from *Farmers' Bulletin*, No. 229, of the United States Department of Agriculture, entitled The Production of Good Seed Corn, by C. P. Hartley:—

'Seed corn should be so well cared for that it will contain no ears that will not germinate, and seed testing should be employed as a demonstration of the fact that the seed has received proper attention, rather than as a screen to separate the worthless from the poorly preserved seed. If through accident or carelessness, a supply of seed has been so damaged that a test of 100 or more representative ears proves that less than ninety-seven kernels out of every 100 germinate, and better seed can not be procured, it is certainly advisable to test the ears separately, and discard the poorest.

'This test can very easily be made by numbering the ears, and then taking five or ten kernels from each ear and placing them in numbered rows in shallow boxes of moist sand, arranging them so that the kernels from ear No. 1, are in row No. 1, etc. If the boxes used are 2 or $2\frac{1}{2}$ inches deep, and a damp cloth is spread over the top after the kernels are placed in the sand, no further attention will be necessary for five or six days, when the results of the test can be recorded. The box should be kept in a warm place where the temperature does not fall lower than 50° F.'

The following paragraph from Circular No. 95, United States Department of Agriculture, Bureau of Plant Industry, is copied here as being of interest in this connexion. This circular, entitled The Seed Corn Situation, is also by Mr. Hartley:—

'The prevailing idea that the thing of most importance is to obtain a good stand of stalks must be discarded. Farmers must consider the productiveness of the stalks of more importance than the number. Full stands can be obtained by the heavy planting of weak seed. Good yields can not be obtained in this way. The most expensive seed to plant is that from which a stand of stalks can be obtained, but from which a good yield can not be obtained. The stand of stalks bears the same relation to the grain yield as the number of trees in an orchard bears to the amount of fruit produced. Productivity as well as quantity must be considered.'

THE PARTIAL STERILIZATION OF SOILS.

The following is a short abstract of an article in *Nature*, November 19, 1914, on the above subject, by E. J. Russell, containing an account in untechnical language of the efforts that are being made to discover the exact reason why the fertility of soils, especially those that are said by the agriculturist to have become 'sick', should be increased by this process.

The increased productiveness of partially sterilized soils was traced to the increased numbers of bacteria; this increase in turn was found to be due to the putting out of action, by partial sterilization, of a detrimental factor present in normal soils. The present position is that there seems no doubt that this detrimental factor is living, and there is strong indirect evidence to connect it with the soil protozoa. But the direct evidence is lacking. The 'sick' soils are being further investigated. That 'sickness' could be cured by partial sterilization has aroused much interest. Lime was investigated by Dr. Hutchinson, and found to answer satisfactorily. Mr. Buddin has found that non-volatile disinfectants, as long as the doses are not too strong, cause some of the soil bacteria to multiply, but the increased numbers of bacteria do not produce any corresponding increase in ammonia or nitrate. Hence the use of these non-volatile substances is not promising. Steam seems for the present to remain the best agent; it partially sterilizes; it effects some decomposition of the organic matter in the soil; and seems to induce a development of fibrous root.

CATTLE FEEDING.

The object of the experiment described below was to test the relative feeding values of maize silage and of mixed hay for cattle, and the advisability of feeding cattle chiefly on roughage during the earlier part of the feeding period, and of adding grain during the later part. Twenty-four bullocks were divided into two lots equal in weight, and of the same quality and breed. The animals in Lot I received as much maize silage as they would consume during the first two months, and each had 3 lb. of cotton-seed meal per 1,000 lb. live weight daily. At the end of fifty-six days they received in addition as much maize as they would eat. The animals in Lot II received daily 20 lb. of maize silage each, and all the mixed hay they would consume, as well as 3 lb. of cotton-seed meal each per 1,000 lb. live weight. After fifty-six days they were fed in addition with as much maize as they would eat.

At the end of the test, which lasted twenty weeks, it was found that the bullocks in Lot I had made a total gain in weight of 3,280 lb. against 3,135 lb. in Lot II, or an average daily gain per animal of 1·944 lb. compared with 1·803 lb. The cost of feeding per 100 lb. of gain was, in the case of Lot I, £1 14*s.* 7*d.*, and in the case of Lot II, £1 19*s.* 4*d.* The profit per bullock, obtained by deducting the initial value and the cost of food from the selling value, was in the case of Lot I, £2 18*s.* 9*d.*, and Lot II, £2 6*s.* 9*d*

The conclusions reached are that maize silage at 16*s.* 4*d.* per ton is relatively more economical and more effective for feeding bullocks than a combination of silage and mixed hay, when hay is valued at £2 16*s.* per ton. Maize silage was found to be more palatable than maize in the ear, and for this reason it is necessary when fattening cattle to limit the amount of silage given, in order to insure the greatest gain in flesh during the finishing period. The experiment bears out the results of previous experiments, which have indicated that when cattle of about 900 lb. weight are put on roughage during the early part of the feeding period, they will make economical gains even though the actual daily gains may be smaller. (The *Journal of the Board of Agriculture*, November 1914.)

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue:

The editorial in the present number treats of the educational function of agricultural departments.

Under the heading of Sugar Industry, on page 2, there appear abstracts of papers relating to this subject, which were read at the International Congress of Agriculture recently held in England, and also notes on sugar duties in Canada, and the working of sugar mills in Java.

On page 5 there is a review of a valuable work on the coco-nut.

The Insect Notes in this number deal with miscellaneous insects from the West Indies, and a report on insect pests in Mauritius.

In the Fungus Notes, on page 14, will be found an article on a dangerous citrus disease due to a fungus which is known to occur in Florida, and a short article on a beneficial fungus of the genus Aschersonia.

On page 15 an article on indigo is presented, which should be of especial interest at this time.

Visit of a Cotton Expert.

Mr. J. L. Fonda, representing the Fine Cotton Spinners and Doublers Association, Ltd., is at present on a visit to the West Indies. In the *Agricultural News* for November 21 last, was mentioned the prospect of Mr. Fonda's visit, with an explanation of its general purpose.

After a few days spent in Barbados Mr. Fonda proceeded to St. Kitts and Nevis, where he has visited cotton growers, and addressed meetings of the Agricultural Societies in both those islands. Mr. Fonda will visit Antigua, Montserrat, and St. Vincent, before returning to Barbados.

Proposed Conference of British and Colonial Entomologists.

In May last the Colonial Office put forward proposals for the holding of a Conference in London during 1915, at which it was hoped that official entomologists from different parts of the Empire might be present for the discussion of questions relating to insect control in the several parts of the British Empire. It was further suggested, that as mycological questions are often inseparable from entomological, it might be of value if mycological officers could also attend.

Such a Conference would be of great value, and there is no doubt that it would have met with hearty support on all sides. Owing to circumstances arising out of the war, however, it has been found desirable to postpone the Conference indefinitely, and the Colonial Office has communicated this decision to Governments and official departments which had been previously invited to participate.

The Barbados Agricultural and Industrial Exhibition.

The annual exhibition under the auspices of the Barbados General Agricultural Society was held on December 16. The weather was everything that could be desired, and, on the whole, the attendance was good.

The exhibits of agricultural products were very creditable, considering the very dry weather experienced throughout the island in the earlier part of the year. On the other hand, the show of stock was exceedingly good, the cattle meriting special commendation. Among these the remarkably fine thoroughbred and high grade bulls of the milking strains, and the half-bred bulls of general utility breeds were very noticeable.

The exhibits of goats also are worthy of particular mention. Specimens of imported thoroughbred animals were shown, along with stock, thoroughbred and others, derived from them. The improvement in the strain of this most useful animal in recent years in Barbados has been very marked—a proof of the value of co-operation, for this improvement is largely due to the efforts in this direction of the Barbados Goat Society.

On the industrial side special mention must be made of the excellent workmanship displayed in the exhibits of various handicrafts. Specimens in particular of the work of joiners and smiths, show that Barbadian artisans can turn out first-class work.

A New Milk Pail.

In the *Indian Trade Journal* for July 23, 1914, there is a note on the efficiency of the 'small top milk pail', a recent American invention for keeping milk free from dirt.

The invention consists of an ordinary pail fitted with a cover with a small apperture in it on the side furthest from the milker. It is claimed that 97 per cent. of the bacteria usually present were kept out when this pail was used in not particularly clean cowsheds. Under better conditions milk drawn into open pails contained six and a half times as many organisms as were found in that in the small top pail.

It would seem therefore that this simple appliance is very effective, but all farmers and milkmen must remember that even the use of such effective appliances does not dispense with the necessity of three essential operations before milking— (1) grooming the cow; (2) washing the udder and teats; (3) washing the hands. It cannot be too strongly emphasized that no invention will render milking a cow with a dirty udder into a half-washed pail with a filthy pair of hands anything but a crime.

Carica Papaya—The Papaw.

'This well-known tree has been subjected to ill-merited abuse, described as ugly and everything that is disagreeable, yet it may be questioned if there is a more handsome or generally useful tree in Indian gardens.'

Under this text, in the *Agricultural Journal of India*, Vol. IX, pt. 9, L. B. Kulkarni, of the Bombay Agricultural Department, has some interesting notes on methods of propagation, and the advantages of causing the trees to branch.

With regard to the first he gives details of experiments made in the Botanical Gardens, Poona, which show that vegetative propagation by cuttings and graftings has been successfully achieved. Both of these processes may prove useful when the propagation of some special variety is of importance. It is doubtful however, as yet, whether they will be of any special value in the practical cultivation of the papaw.

When a papaw tree grows to a considerable height difficulty is experienced in looking after and gathering the fruit. The tree too is liable to be broken off by a heavy wind. In view of these drawbacks experiments have been made at the same gardens to encourage branching, by the removal of the tops of the stems just before the time of flowering. Not more than four branches were allowed to grow, though many more started. The result was a symmetrical head, producing within reach, fruit of uniform size and shape. It was observed also that the branched trees gave a greater number of fruit than those left to grow straight up, though the individual fruit averaged less in weight.

Another point made by the author of the article referred to above, is that according to other experiments made at the same gardens, the best results in papaw fruit are obtained by judicious thinning out from the stem of a certain number of fruit, in fact any that are obviously going to be crushed by others, or are going to be the cause of others becoming misshaped.

The Shortage of Medicinal Plants.

The Board of Agriculture and Fisheries has recently issued a leaflet, No. 288, on the cultivation of medicinal plants in England, pointing out that the supplies of vegetable drugs much in demand are bound to run short on account of the present war, owing to the impossibility of obtaining them from Europe, and giving advice as to the method of cultivation of such medicinal plants as may be possibly grown in England. Among these are three species of Datura, commonly met with in the West Indies. The first is *D. Stramonium*, thorn apple. The principal use of the drug obtained from this plant is as an ingredient in burning powders for asthma. It has been chiefly imported from Germany and Hungary. The price of the dry leaves has risen since the outbreak of the war from 40*s.* to 80*s.* per cwt. A closely allied species, *D. Tatula*, with purple flowers, is occasionally used in medicine in place of *D. Stramonium*. The third species, *D. Metel*, is a valuable source of the alkaloids hyoscine, hyoscyamine, and atropine.

The crop is cut when the plants are in flower. The leaves are stripped off and dried as quickly as possible, usually by artificial heat. The seed is also a commercial article, but in very limited demand. The thorny capsules are gathered when full-grown but still slightly green. They split, and shed their seed on drying.

Preservative Treatment of Timber for Estate Purposes.

The *Journal of the Board of Agriculture*, November 1914, has a note taken from the *Quarterly Journal of Forestry* for July 1914, on experiments undertaken to ascertain whether creasote treatment for preserving timber could be modified or cheapened. Different lots of timber were treated with pure creasote, with creasote saponified by the addition of a very small proportion of caustic soda, and with naphthalene. It has been found so far that the addition of even less than $\frac{1}{4}$ per cent. of caustic soda to pure creasote improves penetration in the case of timbers which take the preservative with difficulty, and that the saponification of the creasote makes it possible to dilute the preservatives with water, thus cheapening the process. For the treatment of estate timber by the simple open tank method, saponified diluted creasote would seem to be a cheap and effective process. Good results were obtained when average creasote was diluted to half its strength. Greater dilution than this was found inadvisable, especially with only partially seasoned timber.

The advantages of using naphthalene as a preservative are that green timber can be treated as effectively as seasoned timber, and that the discoloration of the timber is less than with creasote. It is an excellent preservative, but large quantities are absorbed by most timbers, and at present prices the process would not be cheaper than creasoting.

INSECT NOTES.

NOTES ON WEST INDIAN PESTS.

The following brief notes are based upon the information transmitted in the Items of Departmental Interest for November last, and they present a general account of what is going on in the other islands.

In St. Vincent, the chief pest of cotton was the black scale on cotton. This insect, *Saissetia nigra*, is well controlled, ordinarily, in the other islands, by its parasite, *Zalophothrix mirum*, but in St. Vincent, the parasite, although present, does not seem to exert the same control over the scale insect.

At Montserrat the chaff scale (*Parlatoria pergandei*) is reported to be more troublesome on citrus trees at Grove Station than the purple scale (*Lepidosaphes beckii*). Cotton worm attacks were severe along the Leeward side of the island, possibly the most severe recorded in that island. Cotton stainers are suspected of being connected with the occurrence of the internal boll disease of cotton. It is thought that the punctures made by the stainers in feeding furnish a means for the disease organisms to gain access to the interior of the bolls.

On some of the lime estates, and at Grove Station, hard backs are being collected. The insects referred to as hard backs in this instance are probably the adults of the Leeward Islands root borer (*Exophthalmus esuriens*) which, it will be remembered, appeared in great numbers in certain lime fields in Antigua and Montserrat in the early part of 1914 (see *Agricultural News*, Vol. XIII, p. 250). This collection of beetles marks the adoption of a new practice in Montserrat.

It is also stated that interesting experiments with lime plants are in progress, some of which are in connexion with the effects of Exophthalmus grubs in the soil, and others with the purple scale.

In Antigua also, attacks of the cotton worm were recorded during the month.

In St. Kitts the greater part of the cotton had been reaped, but where this crop was left to make a second growth, leaf-blister mite was much in evidence. A plot of young cassava plants (cuttings) was found to be badly attacked by the root borer grubs (*Exophthalmus esuriens*). This pest seems to be increasing in St. Kitts.

In Nevis the cotton was reported to be attacked by leaf-blister mite, the cotton worm, and a mealy-bug; the first was of general, and the two latter insects of local, occurrence.

The Leeward Islands root borer (*Exophthalmus esuriens*) has come into much prominence during the past two or three years as a pest of cotton and other crops in the Leeward Islands. It has been known for many years as a common insect in those islands, but only recently as a pest. It has been found in Barbados during 1914. Specimens from this last mentioned locality have been examined by Mr. G. A. K. Marshall, Director, Imperial Bureau of Entomology, who reports that while the Barbados specimens differ slightly from those from the Northern Islands, the differences are not sufficient to enable the insects to be regarded as distinct species. Mr. Marshall considers that the Barbados Exophthalmus has probably been established in that island for a long time, and is not likely to prove more of a pest in the future than at present. It has been only once reported from sugar-cane fields in Barbados, being most commonly found in the adult or weevil stage feeding on the leaves of *Agave sisalana* in one small district on the seacoast, in the southern part of the island.

INSECT PESTS IN MAURITIUS IN 1913.

The report of the Division of Entomology for 1913, by D. d'E. de Charmoy, which appeared in the Annual Report of the Department of Agriculture, Mauritius, for 1913, was abstracted in the *Review of Applied Entomology*, Series A, Agricultural, for October 1914.

This abstract is given herewith as likely to be of interest to West Indian planters.

As in previous years, the Dynastid beetle (*Oryctes tarandus*) was prevalent during 1913 on certain sugar estates, but the method of digging out the larvae was adopted more widely, and has proved to be highly beneficial. The Melolonthid, *Lachnosterna* sp., was found on sugar-cane in small numbers, control measures being responsible for a noticeable reduction. *Aphis sacchari* occurred in great numbers on two sugar estates, but by the middle of July all the insects were destroyed by a fungus. The white borer, the larva of a small, greyish moth, not yet determined, was very abundant throughout the island in virgin canes, while burning previous to cropping was suggested in order to protect the ratoons, and to avoid the dissemination of *Chionaspis tegalensis*. A census of the area infected by *Phytalus smithi*, Arrow, made in May and June 1913, indicated that this pest was not spreading. During 1913 some 34 million insects were destroyed, against 15 million in 1912, and 24 million in 1911. The increase of captures in 1913 was probably due to the reward offered being higher than in 1912, and secondly, to a more thorough knowledge of the habits of the beetle. Up to the end of December 1913, some adults, chiefly males, of *Tiphia parallela*, Smith, had been observed in the insectary built for the breeding of this Scoliid parasite of *P. smithi*. Other insects damaging various crops were *Ceratitis capitata*, *Dacus ferrugineus*, *Agromyza phaseoli*, *Prodenia littoralis*, lawn cutworm (*Crambus* sp), *Cratopus punctum*, *Adoretus versutus*, *Sphenophorus striatus* (banana borer), and *Coccus viridis* (*Lecanium viride*), besides numbers of other mealy-bugs and scale insects. Tomatoes were seriously damaged by the eelworm, *Heterodera radicicola*. The 'lawn cutworm', which for the last few years has been a serious pest, was successfully controlled by means of an application of kerosene mixture made as follows: 1 part (by weight) of common soap is dissolved in 20 parts of water, 40 parts petroleum being gradually added; to 24 parts of this emulsion add 16 parts Phenyl or 12 parts Creoline. A 2 per cent. solution of this mixture does not injure grass, if applied at the rate of 11 gallons per 80 square feet for the destruction of subterranean caterpillars and *Oryctes* larvae.

ANTIGUA: REPORT ON THE BOTANIC STATION AND EXPERIMENT PLOTS, FOR THE YEAR ENDED MARCH 31, 1914.

The rainfall recorded for the twelve months reported on, was above the average of the three previous years, and better distributed, so that the appearance of the Botanic Gardens has much improved. The number of plants sent out from the nurseries, when compared with last year, has fallen off to a considerable extent. This may be attributed to the succession of dry years having had a discouraging effect on planters, especially of lime trees.

Among additions to the Botanic Station may be mentioned several species of Eucalyptus not previously grown there, making the collection of these trees quite a good one. Some of the species are being found to be well worth planting in Antigua, as they possess a capacity for resisting drought, and yield excellent timber.

The plot experiments with regard to root crops—sweet potatoes, cassava, yams and tannias—are continued, with a view of definitely ascertaining which varieties give the largest returns. In the case of sweet potatoes, these experiments have been continuously made for the last fourteen years; therefore the results, as tabulated in the report, may be looked upon as reliable. In addition, a series of experiments in plant selection of sweet potatoes is being begun, with a view to obtaining increased yield. Varieties of cassava from Montserrat, Jamaica, and Colombia are being cultivated for experimental purposes, but this appears to be a crop of a very uncertain yield. The plant selection of tannias and eddoes seems to afford grounds for encouragement. It has not, however, been continued long enough to warrant making any definite statement of results. Yams have been the subject of varietal experimentation for the last fourteen years; therefore, as in the case of sweet potatoes, the tabulated results may be received with confidence. Plant selection with this crop also has been started.

Continued trial maintains the position of Essex rape as a valuable fodder crop in Antigua. Imphee also, apart from the grain produced, seems to have done well as a fodder crop. A local plant, known as beggar weed (*Desmodium* sp.), has given satisfactory returns as a fodder plant and green dressing.

An interesting experiment as to the comparative advantages in planting onion seed in nurseries, or directly in the field, apparently leads to the conclusion that in order to take advantage of the early markets, it would be well for the onion grower to plant some of his crop directly in the field.

An encouraging small experimental shipment of tomatoes to the Canadian markets was made, and further efforts in this direction will be continued.

Experiments with papaws, as to the yield of papain, and the best method of drying it, have resulted in the conclusion that the growing of papaws for the production of this drug might possibly prove lucrative, especially as the collection of papain, and the drying of it, do not require heavy or particularly skilled labour.

The experiments with English potatoes, ground nuts, and soja beans yielded poor results.

Turning to the principal industries of Antigua, the sugar-cane crop again suffered from dry weather. The work of Gunthorpe's Central Factory is noticed, showing that from 70,349 tons of cane received, 7,336 tons of sugar were manufactured. The poor yield of canes is attributed to the unfavourable weather conditions. In the Experiment Station, there have been raised a limited number of seedling varieties of sugar-cane. The climatic conditions of Antigua, however, do not seem to favour any large production of these. The results of field experiments in connexion with sugar-cane varieties are dealt with in the usual separate report of the Superintendent of Agriculture for the Leeward Islands, which is shortly to be issued.

A large portion of the present report consists of details of experiments in the important work of cotton seed selection, and in the hybridization of cotton. This latter has been carried on for four years with the object of endeavouring to obtain a cotton which will produce good lint, and at the same time be resistant to the leaf-blister mite. If success be ultimately achieved, it will mean much to cotton growers. The area under this crop in Antigua had increased by 332 acres, a noticeable feature being the number of small growers. Unfortunately the average yield per acre was much less than that of last season. The 150 acres of cotton cultivated in the island of Barbuda, however, gave the good return of 206 lb. of lint per acre. The poor yield in Antigua is probably due to a great extent to the prevalence of boll dropping, the causes of which, and the best means of remedying it, are touched upon in the report.

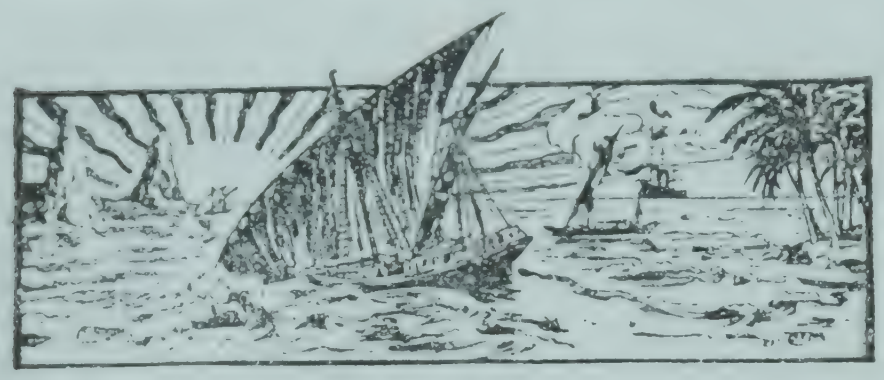
There does not seem to be much encouragement to any great increase in the cultivation of limes in Antigua. Existing lime plantations have done moderately well, but neither climate nor soil seems specially adapted for this crop.

The interest in coco-nut planting seems to be maintained, over 5,000 nuts for planting having been ordered for next season from the Station. The drainage of plantations will have to be attended to if success is to be assured.

Two very encouraging lines of progess are to be noted: (1) the success of the efforts of the Onion Growers' Association on co-operative lines to place the export of their produce on a sound basis, and (2) the similar efforts that are being made with government co-operation, by planters who cultivate maize, to dry the corn, and to convert it into meal, with the view in the first place of supplying the local market. The first of these efforts may be considered to have achieved a measure of success already, and it is hoped that a similar result will attend the second.

In the section dealing with work connected with insect and fungus pests, and their control, the Leeward Islands root borer (*Exophthalmus esuriens*, is credited with extensive damage done to the maize crop, and considerable loss in the cane crop. It also seems to be likely to give trouble on lime plantations. Timely methods of destruction and prevention are necessary. A hitherto unknown disease attacked the tubers of yams in some places; observations and investigations with regard to this are being conducted.

From the conclusion of the report it would appear that the Cadet system continues to work satisfactorily in Antigua.



GLEANINGS.

The staple industry of Turks Islands is salt raking, the produce being chiefly exported to the United States. The value of this export in 1913 was £23,132 out of the total exports of £27,808. (*Colonial Reports*—Annual No. 800.)

The Board of Trade Journal for November 12, 1914, says that the Board of Trade is in receipt of information, through the Colonial Office, that telegraphic instructions have been sent to all British Governments overseas to prohibit the exportation of rubber except to British ports.

St. John, New Brunswick, will soon have one of the finest sugar refineries in North America, run by the Atlantic Sugar Refineries, Ltd. The output will be 500 tons of sugar per diem. The West Indies will furnish the raw sugars. The finished product will be marketed in Canada, and some may go to Great Britain. (The *Louisiana Planter*, November 1, 1914.)

A start has been made at Searles Lake, California, in the manufacture of potash for commercial purposes. It is hoped ultimately that the plant will turn out 120 tons a day, roughly 37,500 tons per year. Statistics show that in 1911 America imported 237,453 tons of potash from Germany, and in subsequent years the imports have been even greater. (The *Gardeners' Chronicle*, November 1914.)

The cultivation of lily bulbs in Bermuda for the United States market is one of the chief agricultural industries. In 1913 the quantity and declared value of the export of lily bulbs were as follows: 2,357 packages, of a declared value of £3,470. The export of onions during the same year had fallen to 65,074 crates as compared with 232,368 crates in 1909. (*Colonial Reports*—Annual No. 803.)

The Director of Industries at Madras reports that at the beginning of September there were about 16,000 tons of ground nuts in Madras ports awaiting shipment to Marseilles. The estimate of the crop in December is about 150,000 tons. The ground nut deteriorates very rapidly by keeping. Dealers with their present stock on hand are refusing to buy, so the crop is being thrown back on the hands of the cultivators. The question of erecting plants for expressing oil from the ground nut is now being considered, in view of the continual closure of the Marseilles market. (*The Board of Trade Journal*, November 12, 1914.)

The immense importance which maize has achieved, not only as a food for cattle, but also for human consumption, rests largely upon its cheapness relatively to other foodstuffs. Maize has however risen greatly in price during the last ten years. As compared with wheat, the average price per hundredweight was, in 1903, maize 4*s.* 11¾*d.*, wheat (British) 6*s.* 3*d.*; in 1912, maize 6*s.* 2¼*d.*, wheat 8*s.* 1*d.* The total world's crop of maize in 1913-14 was no less than 1,733,102,517 cwt., compared with 2,053,345,727 cwt. of wheat; and there are years in which the world's maize crop is actually bigger than the world's wheat crop. (*Tropical Life*, November 1914.)

In Madeira a company was formed in 1908 to develop the growth of tobacco, but it failed. In 1913 this industry was again started, and it appears to promise to be a success. Some Spaniards are employed, who pronounce the soil in the island to be very suitable for tobacco. Havana seed is being planted besides Kentucky and Virginia, but the first is said to be best, as the leaves from the two latter are far too coarse. The most modern machinery for making cigarettes and cigars is being erected, and if the growing is successful, there can be no doubt that this new industry will flourish. (*Diplomatic and Consular Reports*, Annual Series, No. 5356.)

The Annual Report of the Education Branch of the British Board of Agriculture on the disposal of grants for agricultural education and research, for the year 1913-14, shows that the Board is making satisfactory progress with its scheme of organizing agricultural work. It has arranged for most of the Universities to undertake special work in connexion with the various counties, and, in addition, it supports a number of research institutes. The whole scheme has been carefully planned to avoid overlapping. It is not claimed that the scheme is yet perfect; indeed it is not yet in full working order, but it is clear that the fully developed scheme will serve the purpose for which it was intended. Provision is made for higher agricultural education, the provision of technical advice to farmers, the investigation of local problems, and for carrying out agricultural research. The total amount of money granted during the year was £67,939, against £32,434 last year. (*Nature*, September 3, 1914.)

An article in *The Times* for November 24, 1914, states that in the House of Commons on November 23, Mr. Runciman in reply to a question stated that the Board of Trade had entered into consultations with the principal interests concerned, with a view to the elaboration of a scheme for the establishment of an undertaking for the production of synthetic dyes and colours. In the main it was hoped that the capital required would be forthcoming from the industries by which dyes and colours were mainly used, but the Treasury were prepared, within certain limits and subject to certain conditions, to afford financial support to a well considered scheme which would be permanently under British control. With reference to this, the following telegram from London, dated December 24, is worthy of notice: 'The Dye Trade Committee, appointed with the co-operation of the Board of Trade, announces the formation of a Limited Liability Company with a capital of £3,000,000 in £1 shares. The Government will advance £1,500,000 to the company at 4 per cent., and will appoint two directors.'

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

The examinations in connexion with the Courses of Reading in Practical Agriculture of the Imperial Department of Agriculture, were held on November 23, 1914. The following were the questions in the Intermediate Examination. In the paper on General Agricultural Science not more than eight were to be attempted, in which Nos. 1 or 3 and 2 or 4 had to be included. In the Special Crop Subjects only six of the eight questions on each subject were to be attempted:—

GENERAL AGRICULTURAL SCIENCE.

1. Give an account of the characteristics of, the injury done by, and the methods of control for, *either* (a) the brown hard back, *or* (b) the coco-nut weevil.

2. Which one of the following pests of cotton causes most damage in the island you are connected with: (a) the cotton worm, (b) the cotton stainer, (c) the cotton leaf-blister mite? Describe fully the damage done, and the means of control adopted in the case of the pests you select. Explain, as well as you can, why the others are less harmful.

3. Give as many characteristics as you can to show how you would distinguish a large fly from a bee, and the larva of a cotton stainer from that of a beetle.

4. Write an account of the root diseases of any *one* of the following plants: (a) cacao, (b) limes, (c) sugar-cane. State fully the measures adopted in their control.

5. What do you understand by the term saprophyte? By means of examples indicate the benefit and the harm that saprophytes are capable of doing under certain conditions.

6. Why is urine of great manurial value? What measures should be taken to prevent loss of this substance on the estate?

7. Write an account of the operation of budding cacao or oranges. State the economic value of this operation in estate practice.

8. Draw up a score card or scale of points for the field selection of any one of the following: (a) cotton, (b) sugar-cane, (c) corn (maize). Indicate the value of the laboratory in the case of the crop that is dealt with.

9. Of what use to plants are compounds of the following elements in the soil: (a) iron, (b) manganese, (c) magnesium, (d) calcium, (e) sodium, (f) potassium?

10. Give a full account of up-to-date methods of preparing the following for market: (a) oranges, or green or fresh limes; (b) onions or arrowroot.

11. Give details of the methods and cost of harvesting either (a) a 10-acre field of sugar-cane, or (b) a 10-acre field of cotton. [Harvesting should be taken to mean the cutting or picking and conveyance of material to the factory or ginnery as the case may be.]

12. Describe in outline the experimental work carried out during the past three years at the Botanic or Experiment Station in your island. Indicate along what lines the most useful results have so far been obtained, stating your reasons.

SPECIAL CROP SUBJECTS.

SUGAR INDUSTRY.

1. Describe the characteristics of some of the newer seedling varieties of sugar-cane raised in the West Indies and introduced into cultivation during the past three years.

2. Give a concise account of (a) the underground system of the sugar-cane and (b) the variation in the leaf structure. Indicate any economic aspects that occur to you in connexion with these.

3. Describe a system of manuring followed in your district for ratoon canes, and indicate to what extent this is adhered to; also to what extent followed in the case of plant canes.

4. Describe the implements used in the cultivation of sugar-cane and the value of the work each performs.

5. State the measures adopted in cultivating sugar-cane for the prevention of disease and attack of insects. What is the most important disease or pest in your district? Briefly describe this.

6. In what ways do you dispose of the following in your island: (a) megass, (b) molasses, (c) cane tops, (d) stumps of cane?

7. State, in the form of a monthly diary, the field work to be done from the planting of the cane in November or December to the time of reaping.

8. How many labourers would be required to plant a field of 20 acres of sugar-cane? Describe how you obtain the cuttings and distribute them to the men for planting.

LIMES.

1. Give a detailed account of the process of concentrating lime juice both by open tayche and steam-heated pans or vats.

2. Discuss the value of wind-breaks in lime cultivation.

3. Write an account of the methods of gathering lime fruit.

4. Describe the manufacture of citrate of lime. How is it prepared for export?

5. Show exactly what area of land would be needed for a lime nursery to establish 50 acres in limes. Describe the soil and surroundings required for a nursery.

6. What measures should be employed in caring for an old lime estate with a view to maintaining its productivity?

7. Describe the most important insect pests of limes in your district. What measures are adopted for their control?

8. What may be done to improve or maintain the health and activity of the root system of a lime tree?

COTTON.

1. Make an examination of the sample of seed-cotton provided, and express the results of the examination in the form of a table.

2. What are the natural soil and climatic conditions most favourable for the cultivation of Sea Island cotton? How may these be secured, or partially secured, by artificial means?

3. How do you prepare a field for cotton in your district? From what source do you obtain the seed for planting, and how much per acre do you sow?

4. State in detail the measures and precautions you would take to prevent outbreaks of leaf-blister mite, and cotton worm.

5. What are the characteristics of the best type of cotton grown in your district?

6. How is cotton graded, cleaned, dried, and prepared for ginning?

7. What crops can be conveniently grown in rotation with cotton? Describe this cultivation, indicating the time the crops occupy the land.

8. Describe a system of manuring cotton applicable to your district, having regard to continuous cropping with cotton. What have been the general results of the manuring of Sea Island cotton?

FUNGUS NOTES.

A DANGEROUS CITRUS DISEASE IN FLORIDA.

References have been seen recently to a new and serious disease of citrus trees in Florida. Since by some oversight the bulletin describing it has not yet reached us, we reproduce, from the magazine *Modern Cuba*, an article by Dr. J. R. Johnston, which gives the necessary warning to West Indian citrus planters.

As there is a great possibility that the citrus canker may carelessly be introduced into Cuba, it is advisable that every citrus grower should familiarize himself as quickly as possible with its appearance. The following description is given by Stevens of the Florida State Experiment Station:—

'The disease appears as small circular spots, from less than one-sixteenth to one quarter of an inch across. They may occur singly, or several together may form an irregular area. They are raised above the surrounding tissue, are light brown, and composed of a spongy mass of dead cells covered by a thin (white to grayish) membrane that finally ruptures and turns outward, forming a ragged margin around the spot. The general appearance of the spots is much the same whether they are found on the leaves, fruit or twigs. The older spots often become overgrown with saprophytic fungi, and may be pink or black on account of secondary infection by species of *Fusarium* or *Cladosporium*.

'The infections on the leaves appear first as small watery bulging dots, which are usually of a darker green than the surrounding tissue. They may appear on either surface of the leaf, but do not penetrate through the leaf tissue at this stage. The spots gradually increase in size, change to a light brown colour, and become visible on both sides of the leaf. Each spot is surrounded by a narrow yellowish band or zone. Later, the surface of the spot becomes white to greyish, and finally ruptures, exposing a light brown spongy central mass.

'The spots on the fruit are similar to those on the leaves. They project from the surface and retain a circular outline. They do not penetrate far into the rind, and may be scattered singly over the surface, or several may occur together, forming irregular masses.

'The spots on the older twigs are more prominent, and usually larger and more irregular in shape. They show the same spongy tissue and the same colour as those on the leaves. On growth more than a year old, the spots assume a cankerous appearance, and the membrane covering the surface disappears. The spots do not penetrate to the wood, but are confined to the outer tissues of the bark.'

Although this disease is said to resemble the well-known scab, it may be distinguished by its rounder and larger spots, and by its white or greyish colour. The canker does not distort the leaves, nor cause the wart-like projections that are so common in infections of scab. Canker is found on the older wood, while infections of scab never occur on the older twigs and branches.

The cause of the disease has not been determined any more than that it is a fungus, and is infectious. In fact, as regards its infectious nature, it is considered one of the worst pests ever known.

Up to date it has been reported in Florida and the other States bordering the Gulf, and there it has occurred only very recently. That it will be communicated to Cuba and the other West Indies before long seems only a foregone conclusion, unless the utmost care is taken to prevent it.

This disease may be looked for especially in nurseries, but also on the fruit, foliage, and stems of grape-fruit, and occasionally it occurs on other citrus trees.

The safest and surest known way to treat the canker is to burn the affected trees.

ASCOSPORIC CONDITION OF THE GENUS ASCHERSONIA.

Overshadowed by the more abundant forms, the part played by the fungi of the genus Aschersonia as scale insect destroyers has not attracted much attention in the West Indies, or at any rate, one may say with confidence, in the Lesser Antilles. *Aschersonia turbinata* has been recorded from Dominica, St. Lucia, and Antigua, and it was recently found to be abundant on estates visited in the interior of the first-named island, occurring on unidentified scales on the leaves and twigs of lime trees. A species believed to be *A. cubensis* is known to occur in considerable numbers in one situation in Barbados, attacking *Vinsonia stellifera* on lime trees.

In Florida two species of the genus have had a great amount of attention in view of the control they exercise on the abundance of two species of white fly (*Aleyrodes*) on citrus trees. The genus is also well known in the Eastern Tropics.

Hitherto only the conidial forms of these fungi have been described, and the ascosporic condition, though often sought, seems to have completely eluded notice. Professor Thaxter now announces (*Botanical Gazette*, LVII, pp. 308-13) that as a result of a special effort made during a stay of some months in Grenada and Trinidad, he was able to obtain the perfect form of *A. turbinata* in the former island, and of four or five species in the latter. The ascosporic condition occurred either by itself or associated on the same stroma with the pycnidial form; so that there could be no question as to the actual connexion of the two conditions. In some instances it appeared to follow the pycnidia in older specimens, while in others it was as evidently primary in its development, and unaccompanied by pycnidia.' The general character and appearance, it is further stated, recalls that of the genus Cordyceps, to which Aschersonia is evidently closely related. The description and figures given show the asci to occur in bottle-shaped perithecial cavities embedded in the stroma. The ascus is slender, and contains eight filamentous spores, at first continuous, later dividing up into segments which eventually become separated into rod-like unicellular spores.

Professor Thaxter finds that the variability of the species, and the scanty information available regarding their hosts make any attempt at systematic revision at present premature. In this connexion it may be said that owing to the usual very complete envelopment of the host by the stroma of the fungus, the identification of the former is often very difficult.

Material from the Lesser Antilles available for the study of this genus at the Head Office of the Imperial Department of Agriculture is at present somewhat scanty, and more would be welcomed. For the information of collectors it may be explained that fungi taking the form of small pink cushions, expanded or not into one or several cups, and found on living leaves or twigs, may very well prove to belong to the genus in question.

INDIGO.

The production of the dye indigo from some of the many species of the genus Indigofera has been carried on in India from very early times. So profitable was it that in the latter part of the 17th, and first half of the 18th centuries it was widely undertaken in the West Indies, the West Indian species (*I. Anil*) yielding a dye hardly inferior to that obtained from India. Owing however to the superior profits obtained from sugar-cane cultivation, the cultivation of indigo was practically abandoned in the West Indies about the middle of the 18th century, and has never been revived. In recent years also its cultivation in India has been very much restricted, owing to the manufacture, chiefly in Germany, of the synthetic article, which could be produced at a cost lower than that at which it was profitable to place the natural article on the market.

On account of the war the supply of this synthetic article is likely to be very short. Inquiries have been made from the Imperial Department of Agriculture whether it would be likely to be profitable to resuscitate the cultivation and manufacture of indigo in some of these islands at the present time. It must be borne in mind that on account of their ancient acquaintance with the process, the Indian growers can easily at once increase the output of natural indigo to such an extent as to handicap very heavily experimental attempts in this direction in other parts of the world. Again, the manufacture of the synthetic product, long left a German monopoly, can easily be undertaken, if found to be profitable, by the great manufacturing chemists in Great Britain and other countries. In fact, as has been noticed in a gleaning on page 12 of this issue of the *Agricultural News*, the Imperial Government has already expressed its willingness to aid in the establishment of such manufacture. Still as enquiries have been made on this point, some account of the cultivation and manufacture of indigo will be of interest.

It has been found in India that *Indigofera arrecta*, a species from Java or Natal, yields a larger percentage of indigotin, than the more widely cultivated species, *I. sumatrana*, known less correctly as *I. tinctoria*. The species *I. Anil*, wild or naturalized throughout the West Indies, is not considered to be of equal value with either of the other two species.

The cultivation of indigo is apparently not very difficult; the crop matures, under varying conditions of climate, at from six to eighteen months. The dye is obtained from the stalks and leaves of the plant, which are cut when the plant is about 3 feet high. It may be remarked that, like other Leguminosae, indigo is a very valuable rotation crop, and the waste product, after the extraction of the dye, is highly prized as a manure.

The following is an abstract from Sir George Watt's Commercial Products of India, on the manufacture of indigo.

For the manufacture of dye from the plant the wet process is now almost invariably adopted. It is essential to have an abundant supply of water, as the process consists in extraction of the dye-yielding principle from the plant by steeping in water, and the precipitation, from the extract so obtained, of the indigo, by exposure to air—oxidation. At the highest point of the factory there is placed a large tank, from which water can be run to the steeping vats. These are a row of cement-lined brick basins, usually about 20 feet square and 4 to 5 feet deep. Below these there is a row of the same number of slightly shallower 'beating' vats.

The plant is taken from the field and loaded into the steeping vats. As soon as a vat is full, the contents are battened down by beams attached to pegs set in the sides of the vat, and water is run into it until the plant is just submerged. Steeping is allowed to proceed for from twelve to fourteen hours, by which time the liquor becomes yellowish green; it is then run off into the lower or beating vat.

The object of beating is to obtain as thorough an oxidation as possible. The more primitive method is for ten or twelve coolies to enter the vat, and beat the liquor with short sticks, to one end of which a flat disc of wood is attached. The process is considered complete after one and a half hours continuous beating. This hand-beating has been largely replaced by wheel-beating, operated by machinery. Where this is employed, there is one beating vat, running the length of the range of steeping vats, divided along its length by one or two walls, according to whether one or two wheels are employed. These walls stop short of the two ends of the vat, and are merely to give direction to the current set up by the wheel. The wheels consist of flat discs of wood attached to the ends of the spokes radiating from the axle. Beating by this method is completed in about an hour. Beating has been replaced in some modern factories by blowing a mixture of air and steam through the liquor, and, later still, by blowing ammonia through it. Neither of these, however, has been generally adopted.

After beating is complete, the liquor is allowed to stand until the precipitated indigo has settled to the bottom of the tank, leaving a clear red liquor above. This is drained off, and the residual precipitate is pumped into boilers, where having been mixed with clean water it is boiled either by steam or direct heat. When the boiling is complete, the contents of the boiler are run on to a 'table'. This consists of a heavy canvas sheet, wetted and spread on a wooden support. This acts as a filter, allowing the water to drain off, and retaining the indigo as a thick paste. This paste is then transferred to the press, which is a strong square wooden box, with perforated bottom and sides. The interior of the press is lined with damp cloth, and the wet paste is poured into it to a depth of 8 or 9 inches. The lid, which fits the interior accurately, is then screwed home by means of a screw worked by a long lever. This is turned at intervals during five or six hours, by which time the paste will have been pressed into a hard cake 3 or $3\frac{1}{2}$ inches thick. This is then removed to a table, where it is cut by wire into cubes of about 3 inches. These are placed to dry on shelves in an airy room. During the process of drying, the cakes become covered with a layer of mould, which is brushed off before packing. The dried and cleaned cakes are then packed into specially constructed cases, weighed and shipped.

In Ceylon in the last few years there has been some interest in the cultivation and manufacture of indigo. It is claimed that much advantage accrues from the plan adopted there, of employing a process which enables the manufacturer to place his indigo upon the market, not as dried squares, but as a paste, thus avoiding the necessity of much grinding and mixing by the dyers in reconverting the indigo to paste, in which form it is used by them. This paste is exported in lead-lined boxes.

It will be seen from the above that to undertake the manufacture of indigo would require the outlay of considerable capital in the construction of a factory, and also some technical acquaintance with the process.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 1, 1914.

ARROWROOT—1¾*d.* to 4¾*d.*
BALATA—Sheet, 2/1; block, 1/9¼ per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 65/- to 69/6 per cwt.; Grenada, 59/ to 63/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £24 10*s.* per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 2/3 to 2/9; concentrated, £30; Otto of limes (hand-pressed), 8/- to 9/-.
LOGWOOD—No quotations.
MACE—9*d.* to 2/3-.
NUTMEGS—4¼*d.* to 5¾*d.*
PIMENTO—Quiet.
RUBBER—Para, fine hard, 2/8¼; fine soft, 2/1½; Castilloa, 1/9.
RUM—Jamaica, no quotations.

New York.—Messrs. GILLESPIE BROS., & Co., July 24, 1914.

CACAO—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c.
COCO-NUTS—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
COFFEE—Jamaica, 9¾c. to 13½c. per lb.
GINGER—7½c. to 10c. per lb.
GOAT SKINS—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $2·50.
LIMES.—$3·75 to $4·50.
MACE—45c. to 53c. per lb.
NUTMEGS—110's, 11¾c.
ORANGES—Jamaica, $2·00 to $2·50.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., December 21, 1914.

CACAO—Venezuelan, $14·80 to $15·00 Trinidad, $14·25 to $14·75.
COCO-NUT OIL—83c. per Imperial gallon.
COFFEE—Venezuelan, 11½c. per lb.
COPRA—$4·00 per 100 lb.
DHAL—No quotations.
ONIONS—$3·50 per 100 lb.
PEAS, SPLIT—$8·50 per bag.
POTATOES—English $2·75 to $3·00 per 100 lb.
RICE—Yellow, $6·00; White $5·10 to $5·25 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., December 12, 1914, Messrs. T. S. GARRAWAY & Co., December 14, 1914.

ARROWROOT—$4·00 to $4·25 per 100 lb.
CACAO—$8·50 to $10·00 per 100 lb.
COCO-NUTS—$16·00.
HAY—$1·70 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·75 to $3·50 per 190 lb.
PEAS, SPLIT—No quotations; Canada, $6·00.
POTATOES—Nova Scotia, $2·85 per 160 lb.
RICE—Ballam, $5·75 to $6·05 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·00 per 100 lb.

British Guiana. Messrs. WIETING & RICHTER, December 19, 1914; Messrs. SANDBACH, PARKER & Co., December 18, 1914.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	12c. to 14c. per lb.	12c. per lb.
CASSAVA—	96c. to $1·08	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$16 to $20 per M.	$23 per M.
COFFEE—Creole	——	16c. per lb.
Jamaica and Rio	14c. per lb.	16c. per lb.
Liberian	10c. per lb.	11c. per lb.
DHAL—	$5·25 to $5·75	$5·00 to $5·50 per bag of 168 lb.
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	4c.	——
PEAS—Split	——	$9·50 to $9·75 per bag. (210 lb.)
Marseilles	——	——
PLANTAINS—	24c. to 48c.	——
POTATOES—Nova Scotia	$3·00 to $3·25	$3·25 to $3·50
Lisbon	——	——
POTATOES—Sweet, B'bados	$2·40	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
TANNIAS—	$1·92	——
YAMS—White	$2·16	——
Buck	$2·40	——
SUGAR—Dark crystals	$3·35 to $3·45	$3·50
Yellow	$4·00 to $4·10	$4·00
White	$5·00 to $5·25	——
Molasses	——	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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West Indian Exhibits at the Imperial Institute.

THE various committees, and the local Departments of Agriculture in the West Indies have for some years now displayed great interest and energy in connexion with the representation of their several colonies at periodical exhibitions. A West Indian Court is now a regular feature of the Canadian National Exhibition held each year at Toronto; the same can be said as regards the Royal Agricultural Show in England, which has recently extended its scope to include the Tropics; and the circumstance holds good also in the case of the Tropical Exhibitions, which are from time to time held in London and elsewhere.

The West Indian exhibits, contained in the Colonial collections at the Imperial Institute in London, occupy a rather different status from those which are to be seen at ordinary commercial exhibitions. The possibility that this may not be fully understood in the West Indies may explain why, in some respects, these colonies allow themselves to be but poorly represented. Even for economical reasons, proper representation in England of West Indian possibilities is eminently desirable. But, in the case of the Colonial collections at the Imperial Institute, there are other aspects which point still more clearly to the importance of comprehensive representation. The exhibition galleries are not museums in the popular sense of the term. The specimens are in charge of technical superintendents, who are on the spot to answer formal enquiries concerning Colonial produce. These officers are in a position to place visitors in touch with the producers, and they are also able to refer enquirers to the manufacturers. The exhibits are therefore in no way mere ornaments, but are intended to arouse actual interest in the resources of the various colonies, by having their products on exhibition as far as possible in bulk. Very often too, specimens, particularly material like seeds, waxes, and gums, are of value in the identification of recently received samples of the same kind; hence exhibits of the relatively minor products, of perhaps but trifling commercial interest locally, are technically valuable in London. In this small but useful way one colony can help another.

During the past year or two there has been a general trend toward utilizing more fully the potential interests of collections for educational purposes. In the museums and botanical gardens of the United Kingdom a system of guides has been established,

who endeavour to conduct parties of visitors through such institutions, and make observations on the various points of interest, in short, explain things. This idea is soon to be adopted at the Imperial Institute; but it will be applied in a different and, it is believed, a better way. All the lecturing will be done before the visitors proceed to examine the collections. This is preferable to the former method for at least two reasons. First, it is easier to discuss a subject concisely under the conditions of a lecture room than while moving from point to point; secondly, visitors are mentally prepared by this method to take an intelligent interest in the specimens. It may be added that the Imperial Institute has been able to secure an officer, eminently fitted as a traveller and as an educationist, to undertake this work, which will be principally done in connexion with the London County Council and their schools throughout London and the neighbourhood.

These points should appeal to the West Indies, and help to show the value of a comprehensive and up-to-date exhibit. But there is still another way in which the educational value of the galleries comes out. Occasionally, merely as the result of an enquiry by a casual visitor, a very important investigation arises which may, indirectly at least, be the means of considerable development both at home and abroad. Lastly, there is the Imperial aspect. It would seem unnecessary to say much in this connexion, but it may be pointed out that a permanent display of colonial produce in London helps appreciably to maintain mutual interests and sympathy between the Mother Country and the Colonies. Politically, therefore, it is desirable for each Colony to do as much as it can to show to the British public what it produces.

Leaving these general considerations, we may turn now to a brief description of the West Indian section as it is at present. It must be understood that its own equipment rests with each Colony, both financially and as regards the number of exhibits, but the amount of space occupied is naturally limited by the size of the building, and the relative importance of each group of colonies. In the West Indian section, British Guiana now presents the most exemplary display. This is largely due to the combined efforts of the Local Permanent Exhibition Committee and the Department of Science and Agriculture, supported by the enterprise of the British Guiana Government. The first thing which strikes one is the prominence given to the most important industries. In the middle of the section is a handsome case, constructed of British Guiana crabwood, containing specimens of sugar and sugar products. The specimens are in bulk; for instance, Demerara sugar is exhibited in half-barrels of longitudinal section. The enquiring visitor likes to see things in bulk; he wants to be able to handle a specimen, whether it be sugar, rubber, rice, or cotton, and, if possible, to be able to take away a small quantity with him. This question of specimens in bulk is therefore of general importance, though here again the factor of limited space comes in. Against one side of the wall in this section are cases containing specimens of balata, rice, and rubber. On the opposite side of the section is a collection of minerals, principally auriferous rocks representing the gold industry, a collection of great interest, well classified and displayed. On the walls, above, are to be seen diagrams on a large scale, showing the relative importance of the various industries, and space is reserved for extending the diagrams in future years. Below these is a large map of the Colony, designed to indicate the areas under the different crops, and to display other features of economic interest, as for instance, the auriferous areas and the forest land. The construction of the cases from local hardwood is a noteworthy feature. This is made more prominent by the presence of two screens constructed of the same material. Specimens are also to be seen of other kinds of timber for which British Guiana is noted. Taken as a whole, the exhibit is attractive and representative. Considerable space is rightly devoted to fibres and cotton.

The adjoining section, and the one next in importance, belongs to Jamaica and Trinidad. It is understood that the Government of Jamaica has decided to follow British Guiana in the matter of increased expenditure on its display of exhibits in these galleries. Thus the Jamaica section may be considered to be under re-arrangement, and, in a more limited sense, the same may be said of the other West Indian sections. In a general way there is considerable scope for improvement. The exhibits of Trinidad sugar, and even of cacao, the chief industry, are very inadequate. But in the case of both Trinidad and Jamaica there is an extensive exhibit of minor products which, as has already been pointed out, is of considerable educational value owing to its local nature. It would be useful to represent Jamaica's principal industry by models of locally grown bananas, as has been done in the Fiji section.

The Windward and Leeward Islands share half a section. This section is under re-arrangement, and there appears to be some room for this. It seems misleading for instance, for the Virgin Islands—a

Leeward Island Presidency—to be represented in a Windward Island case. The particular exhibit to which reference is here made is that of cotton. The exhibits of Sea Island cotton appear as a whole to be good, especially the St. Kitts samples.

Commercially and educationally it is of the greatest importance that there should be in the islands' exhibits a proper representation of developing industries. One would like to see a much larger display of lime products from Dominica, because the inadequate representation of that island's citrus industries leads to an incorrect estimate of its position in this respect. A better representation of the products of the bay tree from Montserrat, where this cultivation is likely to assume important dimensions, is desirable. But one has to remember the attendant difficulties in these matters. Perishable samples of fruit products are not easy to preserve in good condition, or to display where space is very limited; and the exhibition authorities find difficulty in constantly renewing samples of produce which often quickly assume an industrial status. Some useful representation of perishable articles, like fruit, might well be made, as has been suggested above with regard to Jamaica bananas, by means of models. One thing is very certain, and that is that the smaller colonies might utilize better the wall space in the same manner as British Guiana has done. This would he a convenient and inexpensive way of demonstrating, by graphical methods, many of the new lines of development. With regard to citric products, more adequate exhibits should be presented by islands, such as St. Lucia and Carriacou, where the lime industry is being energetically developed. It must be remembered that most of the West Indian lime products come to England, and are in great demand in English manufactures, particularly in calico printing.

By devoting more attention to the matters outlined above, the West Indian section at the Imperial Institute might be made a very valuable centre of information. On the section being brought before the public by means of the press, which should undoubtedly assist in Imperial matters of this kind, the number of enquiries would increase, and in a general way greater interest in the West Indies would be stimulated in London. Considering the development of co-operative movements in the West Indies, it would seem appropriate to exhibit models of factories or appliances connected with the industries of importance. The main idea is that the exhibits must be attractive, instructive, and up to date. Originality pays. Those who visited the recent International Exhibition last June will remember the stands at which two lady operators were making cakes from St. Vincent arrowroot; this was suggestive of enterprise and orginality. Similar effort on an educational, rather than on a purely advertising basis, is what is needed in the West Indian section at the Imperial Institute.

PROSPECTS OF THE SUGAR INDUSTRY IN ST. LUCIA.

The following report, submitted to the Acting Administrator of St. Lucia, by Mr. A. J. Brooks, the Acting Agricultural Superintendent, and forwarded to the Imperial Commissioner of Agriculture, will doubtless be of general interest:—

Speaking generally, the sugar-cane cultivation in this island is at the present moment in a flourishing condition. A certain amount of anxiety was felt in Vieuxfort district a short time ago, due to the continued drought; heavy rains have now fallen, and there is every prospect of a good crop in April.

I estimate our total crop for the coming season to be as follows: Sugar—vacuum pan, 5,000 tons; muscovado, 150 tons; molasses and syrup, 200,000 gallons. Not more than 8,000 gallons is likely to be exported, as the bulk is used locally in the manufacture of rum, and the feeding of estate cattle.

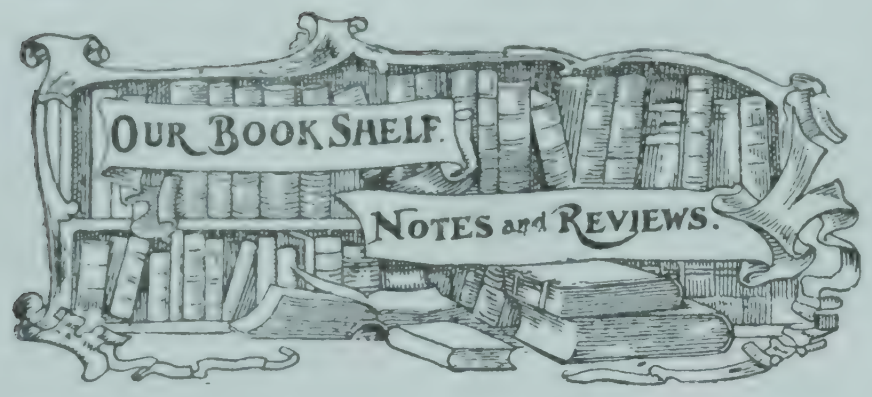
The area available for the cultivation of the sugar-cane in St. Lucia is about 6,000 acres, i.e.—

Dauphin Quarter	100	acres.
Dennery and Praslin	1,000	,,
Micoud (Troumassie and Canelles)	300	,,
Vieuxfort	1,500	,,
Laborie	100	,,
Choiseul (Balembouche and River Doree)	400	,,
Soufrière to and including Canaries	250	,,
Coast lands from Canaries to Roseau	150	,,
Roseau and Cul-de-Sac	2,000	,,
Castries to Gros Islet	200	,,
	6,000	acres.

This estimate includes the best lands; but since 1883-4 cane has ceased to be grown on a good deal of this area, and the machinery in many cases has been sold. Since 1884 the market has been such that only the Central Factories with their up-to-date machinery and improved methods have been able to withstand the great drop in prices. The drop brought about the ruin of almost every muscovado sugar planter in the island; and their factories have been allowed to crumble away. Owing to these circumstances, it would not be safe to rely upon more than 4,000 acres for sugar, out of the 6,000 mentioned.

With an improved market, it is quite possible that this area could be quickly brought into cultivation, and from this an average crop of 8,000 tons could reasonably be expected.

It may be of some service to record the fact that in the year 1875 St. Lucia produced 13,300 hogsheads of sugar, 2,473 puncheons of molasses, and 36 puncheons of rum; and this was at a time when imperfect mills were used, losing anything from 15 to 20 per cent.



COCOA: By Dr. C. J. J. van Hall, Director of the Institute for Plant Diseases and Cultures, Buitenzorg, Java. *Macmillan & Co.*, London and New York. Price 14*s.* net.

The intimate acquaintance of Dr. van Hall with the cultivation of cacao in various parts of the world, notably in Surinam and in Java, coupled with his wide knowledge of tropical agriculture, has enabled him to produce a remarkably sound and interesting book, full of valuable information from cover to cover.

The keynote of the book is struck in the opening words of the preface: 'In writing this hand-book I have done my best to make it practical:' and it is practical in the best sense of the word; practical in that it embraces what is best in regard to the scientific as well as the operative and commercial aspects of the work. The needs of those actually engaged in the production of cacao are kept closely in mind, while the assistance that is afforded them by scientific workers and investigators is carefully shown throughout.

The author uses the word cocoa, but in the publications of this Department it is preferred, when referring to the tree, and to the raw material of commerce, to express it as cacao, thereby adhering to the name by which Cortez originally described the tree. The concise history of cacao given in the opening chapter is instructive. It deals briefly with the early history of the plant and of the use of its seeds, tracing their introduction into Europe and the growth of their use there: the part played by the various Central American and West Indian countries in its production is outlined, and it is interesting to note how soon Trinidad became identified with the industry of cacao production. Not the least instructive part of the historical introduction is that which shows the present position of the world's trade; the recent rapid increase in the use of the article; and the countries from which supplies are derived. A striking feature is the rapid rise of the trade in this commodity in various countries, some of which have only given attention to it during comparatively recent years.

In dealing with the chemistry of cacao and cacao soils (Chap. III), the author intimates how little importance can be attached to the chemical analysis of the soil as affording indications concerning the manures that may be profitably employed, and later he emphasizes the usefulness of properly conducted field experiments to determine this question. In doing so he points out (Chap. IV) that this work rightly falls upon Agricultural Departments and Experiment Stations rather than upon the individual planter, and he proceeds to lay down a few golden rules for the guidance of the worker, followed by suggestions for experiments in detail. The experiments conducted in this connexion in the West Indies, particularly in Dominica and Grenada, receive careful consideration.

As regards the chemistry of the cacao bean, the work of Harrison still remains the standard, and is quoted at some length. The information available concerning the changes that occur during the fermentation and curing of the bean is concisely stated, reference being made to the work of Sack, Ultee, and van Dorssen; but it is pointed out that much more work requires to be done before our knowledge in this direction can be regarded as reasonably complete.

The remarks on the botanical characteristics of the cacao plant are valuable and suggestive, particularly those relating to the nature of the flower cluster, the structure of the flower, and its mode of pollination. It is important to note that evidence is produced on the authority of Dr. von Faber to show that the cacao flower, instead of being insect-pollinated, is self-pollinated, and that the pollen falling from hanging blossoms may settle on the pistils of flowers on neighbouring trees, and effect cross-fertilization. That cross-fertilization does take place is supported by the fact, observed in Venezuela, that the progeny of Forastero types of cacao, planted amongst Criollo trees, show evidence of alteration of type, traceable to the crossing of the Forastero by the Criollo: the same facts have been observed in Java, and are supported by the author's observations in that country.

The author takes the welcome course of simplifying the classification of the varieties of cacao. He recognizes two main types, Criollo and Forastero, the former of which consists mainly of local forms, but with one sub-variety, namely the Java Porcelaine. The Forastero group he subdivides into four, namely Angoleta, Cundeamor, Amelonda and Calabacillo, with their respective local forms. The characters of these are carefully described, and will afford interesting information for many of our readers.

In dealing with the cultivation of cacao the writer is most sound and interesting. Drawing on a large experience he recognizes that the art must be learned by careful practice, and that many local methods, though possibly imperfect, have much to commend them, and makes the significant remark that 'an enormous amount of money has been lost, and is still being lost, by men without local experience who want to improve on the old-fashioned way at once, or who adopt in the Tropics, without thorough experiment, methods used in temperate climates.'

A careful study is made in the book of the establishment of plantations, including the clearing and preparation of the land, the raising and planting of the trees, appropriate draining, and the use of wind-belts and shade trees. The information given is based upon wide knowledge and experience, and will well repay careful study. Fixed rules cannot be laid down to guide the planter, who must lay a foundation of good general knowledge, and then be guided by experience.

The remark (pp. 101-3) that cacao may be considered as a plant which is not very particular about drainage, although coupled with the advice to pay careful attention to this matter, strikes one as strange, and one is led to enquire whether a great deal may not depend on the movement of the subsoil water: a tree may possibly tolerate the presence of water that is moving, even if moving slowly, but may suffer when the water is stagnant. It would seem that instances where trees are growing fairly, though apparently poorly drained, are deserving of further investigation, for they may throw light on problems concerning root-action and drainage.

The curious tolerance of salt, observed in Surinam in the case of cacao trees that have grown in salt-containing soil from the beginning, is both interesting and instructive. The author makes many references to the debated question of cultivating cacao without permanent shade, and states that the way in which the plant is cultivated in Grenada without shade is instructive, and gives the key to the puzzle: he considers that the influence of the shade trees

is effected rather on the soil than on the cacao trees, and that the shading of the soil is the most important function of the shade trees, the soil thereby being maintained in tilth; and that without shade trees more attention has to be paid to operations of tilling and manuring. It may perhaps be suggested that the action of the roots of the shade trees on the soil may also assist in draining it, thus enabling cacao to grow in heavier and wetter soils than would otherwise be possible. The whole subject may well receive renewed consideration on the part of planters who have these ideas before their mind.

The sensitiveness of the cacao tree to wind is well recognized, and the use of trees as wind-breaks and shelter-belts is discussed: the value of many different kinds of trees is mentioned, reference being made to the possible use of some forms of rubber-producing trees in this connexion.

Matters relating to the fermentation and curing of cacao are dealt with at considerable length, and the various methods in vogue in different countries are carefully described in a manner conveying most useful information. Knowledge concerning the changes taking place in the process of fermentation is summarized and brought up to date in a clear and intelligent manner, though it is evident that from a chemical point of view, much work still remains to be done to complete our knowledge of this subject. Seeing that the effect of fermentation is best judged by the users of cacao, it may be regarded as a matter of reproach that the large and wealthy firms connected with the manufacture of cocoa and chocolate have done so little to investigate the question of fermentation, and to provide information as to their requirements for the guidance of planters, who are governed in their methods of production by the demands of the users. Free exchange of ideas between the users and the producers would lead to improvement in the quality of cacao produced in many districts.

A good account is given of the systems of drying in vogue in all the principal cacao-growing countries, and, in connexion with drying, valid reasons are put forward for the practice of claying in certain circumstances, while it is recognized that this practice is unnecessary in others, and is open to abuse.

As may be expected, the chapter on diseases and enemies of cacao is an exceedingly good one. It deals with those that are known in all the various cacao-growing countries: a useful table classifying the diseases and enemies, based on the parts of the tree attacked, will prove of service to the planter in enabling him to determine, in any given case, the cause of the trouble he may have to deal with, and thus enable him to employ the appropriate remedy.

The life-histories, effects on the tree, and the precautions to be taken to control pests and diseases are dealt with in a clear straightforward manner. While abundant information is given, there is no attempt to overload the work with a mass of scientific detail; the requirements of the planter have been carefully kept before the writer, and he has succeeded in arranging the available knowledge and information in a manner that will prove of real service to the cacao grower.

A very important part of the book is that which deals in some detail with the methods of cacao growing in each of the several countries where this commodity is produced. This is remarkably interesting and instructive reading; for the information, though given tersely, is very complete, and throws light on the conditions of soil and climate of the varieties cultivated, the manner in which the work is done, the various pests and diseases met with in each country, together with the extent of the trade and its progress. This important section occupies about one-third of the book, and forms a valuable work of reference which will be appreciated by cacao growers the world over.

Full consideration is given to the industry in Trinidad and the Lesser Antilles. In connexion with the latter, a good deal of attention is given to the circumstances of Grenada, largely on account of the cultivation being carried on there without the use of shade trees; while, as may be expected from the author's intimate acquaintance with these countries, very interesting accounts are given of the industry in Surinam and in Java.

West Indian readers will find much that is instructive in the accounts of the industry as carried on in the large producing countries, such as Ecuador, Venezuela, Brazil, St. Thomè, and the Gold Coast, and, while noting the progress of these countries, will form a clear appreciation of their own position in the cacao world.

A chapter on the commerce in cacao describes the characteristic of the marketable beans produced by each country, and the methods by which they are dealt with commercially; this forms a valuable compendium of information. Following this is a section devoted to the markets, with another on the market prices of different sorts of cacao, closing with a table showing the production of various countries for the five years 1908-12, and the consumption in the various importing countries for the same period. This chapter is a mine of information.

The final chapter deals briefly with the cocoa and chocolate industry, showing in outline how cocoa and chocolate are made, and the extent of the industry in various countries. In this latter connexion it is important to note the changes that have taken place in the industry, and to recognize the great relative advance made by the United States, Germany, Holland, and Switzerland.

The attention of everyone interested in the production of and trade in cacao may be cordially directed to this work. It is replete with information of a practical character, and may be taken as the most complete general account of the subject that has yet appeared.

The Balata Industry in British Guiana.—According to the correspondent of the *India Rubber World*, December 1, 1914, the balata industry has been somewhat depressed from the effects of the war. The season is practically now over, and although from a producing point of view it has been fairly good, from a selling point it has been somewhat disappointing, owing to the unsettling of the markets as a result of the war. During the last two months, however, the position has somewhat improved, and fairly heavy shipments have been made.

Several years of drought have combined to depress the industry, but with improved weather conditions this season, the producers hoped to recoup the losses sustained in recent years, during which the industry has passed through a very trying period. The effect of the war on the markets has very much lessened this expectation.

The war has had also another depressing effect on the industry, because it has caused the postponement of the project of the railway into the interior lands of the Colony. The improvement of communications with the interior must be an important factor in the successful prosecution of the balata industry. The postponement of this railway scheme can only be temporary however, and the demand for balata will doubtless be much increased before very long.

The balata export from British Guiana for the year up to September 23 was 883,392 lb., as compared with 829,157 lb. for the corresponding period last year. Had it not been for the nervousness shown by shippers in the face of war risks, the exports might very probably have reached a record figure.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date December 14, 1914, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 30 bags of new crop West Indian Sea Island cotton have been sold at 14*d.*, with a limited demand. Prices are steady.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended December 19, is as follows:—

There has been no change to advise in the market this week. The receipts were 563 bales, but consisted largely of crop lots, against 799 bales last year. The demand continues for the offerings of Extra Fine, with only a limited demand for the other grades, Fine and Fully Fine. The sales are reported as 224 bales, including a crop lot of 45 bales. Factors are refusing to lower their prices for the odd bags, and can only repeat last quotations. The crop lots continue to be held much above the views of buyers.

We quote, viz:—

Extra Fine	23c. =	13½*d.*, c.i.f. & 5 per cent.	
Fully Fine	20c. to 21c. = 12*d.*	to 12½*d.*,	,, ,, ,, ,,
Fine	18c. = 11*d.*		,, ,, ,, ,,
Fine off in colour	17c. = 10½*d.*		,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester and Havre, up to December 19, 1914, were 50, 623, and nil bales, respectively.

COTTON-GROWING COMPETITION IN ST. VINCENT.

The subjoined report on the results of the competition in Sea Island cotton growing for small holders in St. Vincent, in 1914, has been submitted by Mr. W. N. Sands, the Agricultural Superintendent, to His Honour the Administrator, and forwarded by him to the Imperial Commissioner of Agriculture for the West Indies.

This report shows that prizes of the total value of $62·00 were awarded to the eleven most successful competitors. The Imperial Commissioner has expressed his intention to award also the Diploma of Merit of the Imperial Department to each of these prize winners:—

I have the honour to submit the following report on the Cotton-Growing Competition for prizes, held at Clare Valley Questelles and Linley Valley estates for the 1914-15 season.

The competition was conducted on similar lines to that held in last season, and had for its object the encouragement of the cultivation of Sea Island cotton in the most improved manner.

Owing to various circumstances the competition was more limited in its character than last season, and was confined to the Leeward estates above named. However, these are estates where cotton is extensively cultivated.

In the month of October the plots entered for competition were inspected and reported on by the Assistant Agricultural Superintendent, and during November they were finally judged by me.

As in the previous season, there were two classes in which the small holders could compete.

Class I: For the best Sea Island cotton cultivation of not less than 1 acre on a small holding over 5, but not exceeding 10 acres.

Class II: For the best Sea Island cotton cultivation of not less than ½-acre on a small holding not exceeding 5 acres.

There were twenty-seven entries, eighteen in Class I and nine in Class II.

In judging the plots, particular attention was given to the following points: Banks—formation of and tillage; cleanliness of cultivation; thinning, spacing and staking of plants; evidence of manuring with pen manure, green dressing, or compost; formation and upkeep of drains; nature of intercropping methods; condition of plants in respect of pests and diseases; general condition of crop.

It was very gratifying to observe that the lessons of last season had been well learnt in most cases, for not only did the plots entered for competition obtain a much higher average percentage of marks, but the beneficial influence of the advice and instruction given last season was to be seen in the improved condition of the cultivation in general.

I recommend that the following awards be made:—

CLARE VALLEY QUESTELLES.

CLASS I.

J. Samuel	93 per cent. 1st prize	$10·00
Chas. Thomas	91 ,, ,, 2nd ,,	$ 5·00
Thos. Jack	88 ,, ,, 3rd ,,	$ 3·00

CLASS II.

Hubert Williams	94 per cent. 1st prize	$10·00
Horatio Roberts	89 ,, ,, 2nd ,,	$ 5·00
J. Bramble	87 ,, ,, 3rd ,,	$ 3·00

LINLEY VALLEY ESTATES.

CLASS I.

J. Alexander	94 per cent. 1st prize	$10·00
T. W. Clarke	90 ,, ,, 2nd ,,	$ 5·00
Solomon Derrick	88 ,, ,, 3rd ,,	$ 3·00

CLASS II.

N. Hamilton	87 per cent. 2nd prize	$ 5·00
E. Williams	82 ,, ,, 3rd ,,	$ 3·00

In Class II, Linley Valley Estates, no first prize is recommended.

It was unfortunate that the excellent plots shown at Linley Valley by Jeremiah Providence and Patrick McKenzie were under the acreage required for Class I, and had to be disqualified.

Fly Larvae in Horse Manure may be effectively and economically destroyed by the use of commercial borax. According to Bulletin No. 118 of the Bureau of Entomology, United States Department of Agriculture, the application of 0·62 lb. of borax to each 10 cubic feet of horse manure was found to kill eggs and larvae, and it was also found that in the case of many crops the addition of this amount of borax was not detrimental when the manure was applied to the land In order to prevent the hatching of the eggs, the borax should be applied to the horse manure immediately it is removed from the stable. The maggots congregate about the edge of the manure pile, and on this account most of the borax should be applied in this situation.

ABSTRACTS OF INTERNATIONAL CONGRESS PAPERS, 1914.

The following abstracts of papers on rubber, cacao, and maize, read at the International Congress of Agriculture, London, 1914, have been forwarded by Mr. W. R. Dunlop for the benefit of readers of the *Agricultural News*:—

CEARA RUBBER CULTIVATION AND MANUFACTURE IN SOUTHERN INDIA. By R. D. Anstead.

The writer states that this rubber can be grown profitably in hill districts at elevations of 800 to 5,000 feet, with a rainfall of 50 to 80 inches where Hevea will not grow at a profit. Best planting 15 × 15 feet. Subsequent thinning and removal of weak trees necessary. It is inadvisable to tap before the trees are five to six years old. The best method of coagulation is with hot water in a dark room. As regards profits, during 1913 in Southern India, when rubber prices were extremely low, a profit of 10½*d.* per ℔. was made.

CASTILLOA RUBBER TREES IN MEXICO. By Ashmore Russan.

The writer, who has a wide practical experience with this cultivation, was unable to say much in favour of Castilloa rubber, but he made several instructive observations, particularly in connexion with tapping. Hevea requires delicate treatment in this operation, but large gashes have to be made in the Castilloa tree. Hence the refined tapping tools used for Hevea are useless for Castilloa. One advantage attendant on Castilloa cultivation lies in the fact that the trees require tapping but twice a year, compared with 100 to 200 times a year in the case of Hevea. Hence where labour is scarce, other things being equal, Castilloa would seem to be the more desirable tree to grow. But the writer admitted the general falling off in yield of Castilloa latex, and on this ground he considered further planting of this tree inadvisable, especially in view of Hevea competition.

ANIMAL PESTS OF THE HEVEA RUBBER TREE. By E. E. Green.

In this paper the author makes a reference to slugs, which may be of interest in the West Indies. He states that the West Indian slug, which has similar habits to the Ceylon species, might be controlled by girdling the base of trees with coco-nut fibre steeped in coal tar—not cotton wool—as suggested by Professor Newman. The object of the tar is to disguise the smell of the host plant which is the stimulus of attraction. It is well to keep the base of the trees free from trash, etc., and to sprinkle cinders around them.

From the communication sent to the Congress on Variability in Plantation Rubber, it would seem that the most important factor *under control is rate of cure*, that is the working of the rubber in the estate factory, after coagulation. Varying degrees of grinding, for instance, in making crêpe rubber, leads to variability in strength. The North British Rubber Company's expert stated that his firm preferred plain sheet rubber, but Dr. Schidrowitz thought that was because that firm with its technological department was able to select the best. He thought there was more variability in sheet than in crêpe. Unanimous agreement was expressed as regards the necessity of co-operative, research between manufacturers and growers.

In his paper on the Principles of Hevea Tapping, Mr. T. Petch made the following commendable observation on the necessity of pure research in tropical agriculture: 'The experimenter should not permit himself to be deterred by the criticism that his tapping problem is "purely academic". Our knowledge of rubber tapping would have been in a far more advanced stage to-day, had Experiment Stations and Botanic Gardens restricted their tapping experiments to "purely academic" problems during the last ten years.'

THE GOLD COAST CACAO INDUSTRY. By the Director of Agriculture, Gold Coast.

It is due to the climate, more than to the soil, that the Gold Coast is pre-eminently a cacao-growing country. The rainfall is not excessive, but the humidity is high owing to the wealth of vegetation. In fact the rainfall is actually lower than in any other cacao-growing country, and a reduction in the humidity would be followed by disastrous consequences. The natives are not fully alive to the seriousness of the position, as the destruction of forest in making new clearings is being somewhat ruthlessly undertaken all over the country, and a Bill, recently introduced by the Government, for the regulation and preservation of the forests, is being rigorously opposed by the native owners of the land.

The writer makes reference to the spontaneously produced hybrid variety of Gold Coast cacao, which has been called 'Cundeamor' because of its external resemblance to a Ceylon type of that name. This variety is prolific, and produces very much larger beans, which have been pronounced of superior quality. This variety is being largely sought after by the natives.

The author regards the disease and pests menace as most serious.

In connexion with Mr. J. Burtt-Davy's paper on the Production of Maize, with special reference to South Africa, an interesting idea may be alluded to. The South African Government have adopted a system of supplying official samples representing the various grades of corn (registered) exported from the Union. Various commercial and technical institutions at trade centres are supplied with these representative samples, and intending buyers can rely upon them in coming to a decision as to what they wish to purchase. These samples can be seen, for example, at the Imperial Institute, London, in the South African Section.

STOCKS FOR FRUIT TREES.

An interesting and instructive article in the *Monthly Bulletin* of the California State Commission of Horticulture, for November last, was entitled Stocks for Fruit Trees, by U. P. Hedrick, of the Agricultural Experiment Station, Geneva, New York.

The article is briefly summarized in a paragraph which is quoted herewith.

The future of fruit culture is bound up with the nature of the stock. The stock modifies the stature of plants; suits them to the soil and to the climate; influences fruitfulness; changes the time of maturity, size, colour, and flavour of the fruits; and affects the length of life of the trees. The stock, too, is influenced by the scion. The method of growing the stock, whether from cuttings or from seeds, is important. The effects of the stock on the scion, appreciable though they are, do not change the identity of a variety, and are not heritable. If these arguments are well taken we can only conclude that fruit growers and nurserymen must give the question of stocks much more careful thought, to the end, I am sure, that we shall thus secure more fruitful orchards.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

VOL. XIV. SATURDAY, JANUARY 16, 1915. No. 332.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the West Indian exhibits at the Imperial Institute, giving some description of them, and pointing out their educational and commercial value.

On page 20 there will be found a review of van Hall's excellent book on cacao, which has recently been published.

Under the heading Cotton, we publish a report on the cotton-growing competition in St. Vincent, which contains a list of prize winners.

The Insect Notes in this number give an account of the use of cyanide of potassium in trees as an insecticide, and shows the injury done to trees by this means.

The Students' Corner page presents the remainder of the questions set in the recent examinations in connexion with the Reading Courses in Practical Agriculture.

The Fungus Notes, on page 30, give a review of the information concerning the diseases of cacao and coco-nuts, contained in the books on these subjects reviewed in the present number (p. 20), and in the last number (p. 5) of the *Agricultural News*.

Personal Notes.

The importance of scientific veterinary work is generally recognized in progressive agricultural communities. It is gratifying to note that the Government of St. Kitts has realized this, and has taken steps to provide that island with a skilled veterinarian. In conjunction with proprietors of certain estates there, who have guaranteed to contribute a certain proportion, the Government has arranged to provide the necessary salary of a Veterinary Surgeon. Mr. J. Lionel Shannon, D.V.M., has been appointed to this post of Government Veterinary Surgeon in St. Kitts, and he is leaving Barbados shortly to take up the appointment.

Mr. E. M. Peterkin, First Field Assistant on the staff of the Department of Agriculture of Barbados, has resigned that position to accept an appointment as Agricultural Instructor under the Department of Science and Agriculture of British Guiana.

Mr. Peterkin has for some years been in charge of the field experiments in cotton growing and cotton hybridization carried on by the Barbados Department of Agriculture.

Cold Storage for Tropical Fruits.

Experiments as to the effect of cold storage on star apples, avocado pears, papaws, pine-apples, mangoes, and water-lemons have been made at the Hawaiian Agricultural Experiment Station, and reported in Bulletin No. 47, October 10, 1914. These experiments occupied six months.

With regard to star apples, the conclusion was reached that if intended for cold storage, they should be picked in a half-ripe condition, cured in a well ventilated room for about two days, and they will then keep well for three weeks at a temperature of 32°F.

Papaws did not seem adapted to cold storage on account of their tendency to develop mildew, which grows very rapidly on the drops of juice exuding from the smallest skin puncture.

Avocado pears, picked green, and kept in cold storage for two months, ripened with good flavour within three days after removal from cold storage, and held their flavour well for a period of six days. This fruit seems well adapted to cold storage.

The conclusion was drawn from the experiment that half-ripe and ripe pine-apples may be kept at a temperature of 32°F. for at least a month, without harm to the colour or flavour of the pulp.

Mangoes, removed from a temperature of 32°F. after a month, showed slight shrivelling of the rind, but were found to possess pulp in perfect preservation, with good flavour and no noticeable changes.

Water-lemons seemed to be the best adapted to cold storage preservation of all the fruits with which experiments were made. This fruit kept in perfect condition both at the temperature of 32° and 36°F. for a period of three months, the appearance of the rind and the pulp of the fruit being the same in all respects as when the fruit was put into cold storage. They held their flavour and physical appearance for four days after removal from the refrigerating chamber.

A Substitute for Jute.

The Board of Trade Journal, December 3, 1914, notes that the failure of the usual supplies of jute from foreign countries is causing serious inconvenience in Germany to the users of sacks. Increased employment is being made of a jute substitute, an artificial fibre called 'Textilose', manufactured in various factories in Austria, and also in Germany, at Oppeln in Silesia. Steps are being taken to increase the output of this material, whereby the shortage of sacks will be less severely felt.

Transport of Produce in Dominica.

In a report recently received from Dominica an account is given of the first long distance wire ropeway in that island. This means of transport has been erected by Mr. Campbell for conveying produce from Neba to Clark Hall estates, a distance of $2\frac{2}{3}$ miles. From Clark Hall, a motor lorry furnishes transport to the coast. The working of this arrangement will be watched with interest, since, if it is as successful as it promises to be, it will be likely to indicate a solution of the transport difficulty in many rather inaccessible places in mountainous districts.

Canadian Customs Laws.

It is of importance to shippers of produce from the West Indies to Canada, if they wish to obtain the full benefits of the preferential duties in that country accorded by reciprocity agreements, that they should comply exactly with Canadian laws in the matter of the filling up of invoices. The following, taken from Heaton's Annual—Commercial Handbook of Canada—for 1914, p. 204, will probably prove useful to shippers:—

'Every shipment must be accompanied by an invoice. Invoices must show the marks and numbers on each package, a sufficient and correct description of the goods, the quantities and values of the articles in each package, and "fair market value", also selling price to purchaser in Canada if sold before shipment, the amount of any freight prepaid on such goods, and the amount of any freight allowance made by the exporter to the purchaser in Canada. Invoices should also contain terms of purchase, where goods are actually sold. If in any package goods are enclosed which are not included in the invoice of such package, the enclosure (to avoid seizure) should be noted on the invoice of the outside package containing the enclosure—thus, "three parcels enclosed" (or as the case may be).'

In declaring 'fair market value' for goods shipped on consignment, it would seem that some distinction might well be made between the value of a small experimental shipment, say of such things as ground nuts or sweet potatoes, and the declared value on large shipments of the same kind of products. Such things in small parcels could easily be locally disposed of at remunerative prices, but their value in any considerable quantity would be relatively very much less in local markets. Consequently the 'fair market value' per pound of ground nuts, for instance, would be proportionately much higher than if quoted per ton.

Anti-strangles Serum.

Among the advertisements in the *Veterinary Record*, November 21, 1914, there is one from the well-known firm of Burroughs, Wellcome & Co., London, drawing attention to their preparations for veterinary use of streptococcus vaccine, and of anti-streptococcus serum, for the prevention and treatment of 'strangles' in horses. In the same number there appears a letter from George W. Dunkin, M.R.C.V.S., an army veterinary surgeon, noting the success of treatment of this disease by the serum, but strongly advocating the use of the prophylactic vaccine. He says that at the Reserve Department in Canterbury, 100 horses were experimented with. They were all free from any macroscopic evidence of strangles—fifty were treated with the prophylactic and fifty were left as controls. At the end of a fortnight all were examined. Of the fifty which had been vaccinated, only four had strangles, and two others had abcesses in the neck at the point of inoculation. Of the fifty controls no less than twenty-three had contracted strangles, and in nearly every case the throat had to be opened. Prophylactic treatment with the streptococcus vaccine is therefore highly recommended.

Change of Seed.

The question of the advisability, with a view to improved yield, of changing the seed of a crop grown in any locality, is one that arises from time to time. Some authorities in the past have advocated this, but lately it would seem that in very many parts of the world this opinion has been very much modified, to say the least. The officials of the Imperial Department of Agriculture for the West Indies have consistently pointed out, both with regard to cotton and maize, the better way of careful seed selection, as a means of improving the crop. The *Agricultural Gazette of New South Wales*, November 2, 1914, is apparently coming round to the same way of thinking In an article on plant improvement, the writer, J. T. Pridham, says about wheat, that change of seed is occasionally beneficial, but in most cases does not give nearly such good results as home-grown seed, when farmers pay attention to the selection of seed.

In the case too of potatoes, which are a crop of vegetative reproduction, and which therefore may be supposed to tend to deteriorate more than crops propagated by seed, the writer says: 'An experienced grower will detect the most productive plants in a crop, and the more careful the selection, the better will be the resulting crops.' He concludes with the following common-sense advice, which seems practical also for West Indian growers of tuberous crops like yams: 'It will very rarely pay to substitute fresh seed for home-grown selected seed, unless the former comes from a locality of similar climate, and has been also subjected to selection.'

It must also be remembered that the importation of fresh strains of plants is attended with some risk of disease infection. The selection in the home field of healthy prolific plants for seed of the next crop is one way of keeping away many pests and diseases.

INSECT NOTES.

CYANIDE OF POTASSIUM IN TREES.

In two recent numbers of *Science*, short articles have appeared on the use of potassium cyanide for the destruction of scale insects on leaves and branches of trees, by placing the poison in a hole bored in the stem of the tree.

In the first of these articles a correspondent wrote to *Science* giving his experience in treating a few trees which were attacked by scale insects, and generally lacking in vigour. In this case it was believed that the operation was successful in reducing the numbers of the scales, and in improving the general condition of the trees. The later article is a communication from Professor H. A. Surface, State Zoologist, Department of Agriculture, Pennsylvania, who is very strong in his condemnation of this method. After the appearance of the first of these articles (*Science*, October 9) trials were made at the Office of the Imperial Department of Agriculture in order to see whether certain plants would show any result from the use of the cyanide. Three trees were chosen: a small mulberry (*Morus alba*), a king of flowers (*Lagerstræmia indica*), and a red gum (*Bursera gummifera*).

The cyanide was applied as follows: a hole $\frac{3}{8}$-inch in diameter was bored into the stem of the tree to a depth of about $1\frac{1}{2}$ to $1\frac{3}{4}$ inches, then nearly filled with finely crushed cyanide of potassium, and plugged with paraffin wax. This was done on October 21, 1914. A few days later the mulberry tree showed signs of some injury, as the bark in the vicinity of the hole was discoloured; the Lagerstræmia and the Bursera gave the same indication in a short time also.

On January 7, 1915, an examination was made of the three trees. The mulberry was badly infested at the time the trial was started by a white scale, *Aulacaspis pentagona*. This tree is now very nearly dead, but it may be said that in this respect it is not very different from adjacent trees of the same kind suffering from the same scale insect attack. What is very noticeable however, is the large area of dead and blackened bark in the immediate neighbourhood of the hole which contained the cyanide.

In the case of the Lagerstræmia, the injury to the plant is indicated in the same way by an area of dead and discoloured bark.

The Bursera tree gives a very much clearer idea of what has happened, because of its larger size, and of the greater length of trunk. The hole for the cyanide was bored at a height of about $3\frac{1}{2}$ feet from the ground, at which point the trunk of the tree is about 2 feet in diameter.

The injury resulting from the application of the cyanide was easily to be seen in the dead and blackened bark to a distance of about $3\frac{1}{2}$ feet upwards, and 8 or 9 inches downwards, from the hole. When the bark was removed it was found that the cambium and bark had been injured sufficiently for the injury to be easily followed to a distance of nearly 5 feet upwards and 18 inches downwards.

This indicates that the cyanide was taken up by the sap to some extent, and that when applied in that manner and in that quantity, it is capable of causing severe injury to the tissues of the plant.

This test does not prove anything with regard to the effect of cyanide applied in this manner on insects on, or in the tree, but it is obviously a dangerous method to employ—one which is liable to result in serious injury to the plants so treated.

The following extract is from Professor Surface's communication in *Science*, already mentioned, in which he states that cyanide of potassium is the chief basis of treatment by a firm located in a town in Pennsylvania which does an extensive business, claiming to render trees immune from attacks by all insects and diseases, and also to fertilize them:—

'Their theory is that a tree can be given medicine, as well as food, by placing the same in capsules and fastening these in incisions under the bark. While the chief insect poison is cyanide of potassium, yet they use chlorate of potash and sulphate of iron "to give the trees chlorine, sulphur, iron and potash". They make wonderful claims for destruction of the scale, and invigoration of trees, and commenced by charging 50c. per tree for the so-called "vaccination". The price is now reduced to 15c., but they are taking thousands of dollars from the confiding public.

'The important scientific point is that I have examined hundreds of trees treated by them, and have in some instances found no evidences that scale insects were ever present, while in others I have found the San José scale alive on the trees some time after treatment. What is much worse, is that I have found, it is true, that some one or more of these chemicals is evidently taken up in the sap of the tree, and that to a considerable extent. While the material was placed under the bark about 3 feet from the ground, it blackened the cambium layer as high as I could reach and remove the bark, and started blight or death of tissue at the place where inserted. I have the names of scores of persons whose trees or orchards were finally killed by this treatment. One man, whose name and address I can give, thought that it benefited his trees, and had it applied the second year, and the trees then died quickly.'

BEAN CATERPILLARS IN FLORIDA.

The Florida Agricultural Experiment Station has for several years past been carrying out extensive experiments in the cultivation of velvet and other related beans, and in the production of useful hybrids.

According to the Annual Report of that Station for 1913, which has just been received, the velvet beans under cultivation there were, in 1912, seriously attacked by the larvae of the corn ear worm (*Laphygma frugiperda*), of which the local name in Florida is the grass worm; and also by the velvet bean caterpillar (*Anticarsia* [Thermesia] *gemmatilis*), which is known in the West Indies as the woolly pyrol moth.

The latter of these was often found to be heavily parasitized by an entomogenous fungus, which in many instances exercised a fairly complete control over it. At other times, however, especially in the dry weather, the Anticarsia larvae nearly destroyed the crop. It was necessary to experiment with insecticides for the control of these caterpillars, but as velvet beans, like many other leguminous plants, are very sensitive to the effect of poisons, the problem was rather difficult.

It was found by repeated trials that a fairly satisfactory control could be maintained over these caterpillars by the use of arsenate of lead applied as a spray, and of zinc arsenite. The caterpillars were not all killed by any one application, and there was always some burning of the leaves.

These results are of importance to planters in the West Indies, and should lead them to experiment with these substances in order to find out at what strengths, and at what stages in the growth of the plant they may be applied to combine the greatest degree of efficiency with the least injury to the leaves of leguminous plants.

BARBADOS: REPORT ON THE SUGAR-CANE EXPERIMENTS, 1912-14.

Copies of the Report of the Barbados Department of Agriculture, on Sugar-cane Experiments for the season between 1912 and 1914, giving the results of the manurial and variety experiments for that period, have been received.

The total rainfall recorded for twelve manurial and experiment stations for the period under review, December 1912 to May 1914, ranges from 43 to 86 inches, two stations having a total below 50, and three above 70 inches. A drought, which set in towards the end of December 1913, and lasted until the end of the reaping season, seriously affected the returns from the experiment plots

The results obtained from some of the manurial plots are reported to be so anomalous as to leave no doubt that a disturbing factor has been present that has masked the true results of the manuring of these plots. This disturbance is believed to have been caused by the attacks of grubs of the root borer (*Dioprepes abbreviatus*), of which insect 10,000 adults were caught on young sugar-canes in three adjoining fields. The same insect also occurred to a greater or less extent in all but three of the sixteen stations at which the variety experiments were carried on.

In the manurial experiments a general application was made of 20 tons of farmyard manure to the acre, and the effects of a further application of farmyard manure and of other manures, and combinations of manures were then tested in the respective plots. All the plots which received sulphate of ammonia gave an increase over those which received no additional nitrogen. The most favourable result from the application of nitrogen in any form was obtained on the plot that received 60 ℔. of nitrogen as sulphate of ammonia, 15 ℔. in January and 45 ℔. in June. Plots receiving nitrogen in the form of dried blood also showed an increase, but this, on the whole, was not so great as with sulphate of ammonia. The phosphate series gave negative results, thus confirming previous experience with this manure. The best result in the potash series followed the application of 160 ℔. of sulphate of potash in January.

Some attention was given to the important question of the extent of the experimental error which should be allowed for in trials conducted on the plan adopted in Barbados. The two middle rows of four plots of four rows each of the variety B.6450 were compared for this purpose. The difference between the highest and the lowest amounted to 1,006 ℔. of saccharose per acre (12 per cent.). The difference between the highest and the average was 6 per cent., and between the average and the lowest, 5 per cent.

Coming to the section dealing with the results of the variety experiments, we learn that no artificial hybrids were obtained in 1911 and 1913; but in 1912 three were produced, of which one survived. So far as the trials yet extend, it appears that none of the attempts made to secure hybrids of controlled parentage has resulted in producing a cane superior to the best varieties obtained in the ordinary way.

Since 1898, a total of 63,869 'varieties' have been raised from seed; of this number 6,900 reached a second or third stage, 2,429 were under cultivation in the season under review, and 688 were reaped and analysed.

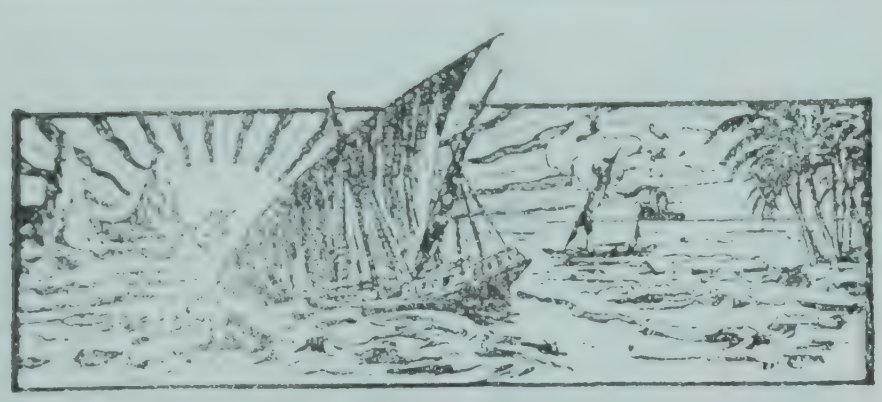
The average yield of plant canes of the variety used as a standard, the White Transparent, from twenty-two plots in the black soil districts was 6,154 ℔. of saccharose per acre. The seedling B.6450 maintains its superiority with an average yield of 7,776 ℔., i.e. 1,622 ℔. per acre better than the White Transparent. This result is repeated in the red soils (eight plots) with yields of 7,710 ℔. and 9,703 ℔., respectively, an increase of 1,993 ℔. A general comparison of the remaining seedlings of established worth for the period under review is of doubtful value, owing to the small number of plots on which some of them have been grown, but it may be noted that the results place the well-known B.147 (six plots), B.208 (two plots), and B.376 (six plots) close to the bottom of the table of eighteen varieties, and below the White Transparent. In the table of selected varieties, for the five years 1910-14 (black soils, plant canes), the cane B.6450 (eighty-nine plots) comes first in order of yield, with 7,529 ℔. of saccharose per acre, B.6308 (twenty-four plots) second, with 7,412 ℔., and White Transparent fifteenth, with 5,858 ℔. In the corresponding table in the red soils B.6450 is first, with 10,083 ℔. per acre, B.3922 second, with 8,553 ℔., and White Transparent sixth, with 6,438 ℔.

The table comparing varieties on the basis of yield as plant canes, first ratoons, and second ratoons, red soils only, gives the highest place to B.3922 (twelve experiments), with B.6450 second (twenty-two experiments.)

The notes given in the detailed tables show extreme variations even on the same estate in the prevalence of such powerful factors as root disease (Marasmius), and root-borer, with additional disturbances due to red rot disease, and to rats. This fact, taken with the normally high experimental error already mentioned, emphasizes very forcibly the danger of forming conclusions except from a long series of such experiments.

An interesting feature of the report is the account of an attempt made to obtain actual estate returns of the results from various seedlings. Of 271 estates appealed to, replies were obtained from fifty-seven. Of these, twenty-one were rejected for reasons not stated, leaving twenty-nine from the black soil districts, and seven from the red. In the first-named class, the average yield per acre of plant canes, where they could be weighed, was 25·6 tons from B.6450 (1,079 acres), 23 tons from B.376 (385 acres), 23 tons from B.147 (203 acres), and 20·5 tons from White Transparent (68 acres). On the estates where instead of weighing the canes the juice was measured, the results are similar, except that B.147 (26 acres) was placed below B.376, (150 acres). The results with ratoons on black soils, and for plants and ratoons on red soils are stated for B.6450, B.376 and White Transparent, the order given being maintained in each case. A somewhat hazardous calculation gives the increase of value, if the 30,000 acres reaped annually in Barbados were planted with B.6450, over the same area if planted with White Transparent, as £160,000.

We note that it has been decided by the local Executive that the issue of the customary pamphlet summarizing the results of these experiments is to be discontinued. The possibly related omission from the account of the manurial experiments, of the summary of results for the period since these were established, robs this section of much of its practical interest, while the absence of a table of contents makes reference troublesome. The report records a large amount of instructive work, and the results are worthy of presentation to planters in the most convenient and practical form.



GLEANINGS.

The report of the Acting Curator of the Botanic Gardens, Tortola, states that very heavy rains fell in that island during the month of November, 9·64 inches having been registered at the Experiment Station. The cotton fields have been much improved thereby. The plants look green and promise a good second picking.

The *Louisiana Planter*, December 19, 1914, states that in Jamaica two of the sugar-cane districts will have a moderate crop of sugar next year, one will have an average crop, and the other district will not have any crop. The district from which no sugar will come is one of the best sugar districts in the world, but the lack of rain has caused the loss of this crop.

The *Queensland Agricultural Journal* (November 1914) mentions a wasteful practice in sugar-cane cultivation in the Philippines: 'the ashes from the bagasse are usually applied to the roads, or used to fill up depressions about the factory. They might be combined with the filter press refuse, and thus a complete fertilizer made for canes, which might be applied with benefit on practically all cane soils.'

During the first fortnight in December the cacao market has continued to display a very firm tone, all descriptions showing a further substantial advance in value. An active demand, chiefly for export, caused competition, and the bulk of the supplies were disposed of at figures which mark an advance of 8*s*. to 10*s*. per cwt. on last mail's quotations. (*Fortnightly Market Report*, Gillespie, Bros. & Co., London, December 18, 1914.)

No pasture, however rich, will stand continuous close grazing by sheep. Where possible, both cattle and sheep should be kept, the latter invariably following the former; where sheep only are kept the pasture should receive an occasional spell of rest, to permit the recovery of the finer grasses and clovers, which constant close grazing will eventually kill. (The *Journal of Agriculture*, Victoria, November 1914.)

The Rubber Growers' Association on August 25, 1914), issued a Circular from which the following is taken: 'the raw material for the production of acetic acid, namely calcium acetate, is derived chiefly from the North American Continent. This is converted to glacial acetic acid chiefly on the Continent of Europe. There are only two English manufacturers. At the present time we understand the manufacturers are besieged with orders, and cannot undertake at the moment to supply any acid, although they may be in a better position later on.'

Sugar-cane, in common with other grasses, has a limited range in depth of root development. Of some thirty varieties under cultivation at the Coast Experiment Station in Natal some time ago, the Uba and D.74 alone showed a deeply rooting habit. The roots of Uba plants have been traced to a depth of 12 feet, and those of D.74 to a depth of 5 feet, none of the other varieties having penetrated below a level of 18 inches beneath the surface. (Durban *Agricultural News*, October 15, 1914.)

The reason why the young fruits drop in certain breadfruit trees so that none mature, is because there is too much vegetative vigour in the tree, usually caused by a too plentiful supply of water at the wrong time. The owner of a breadfruit tree on which the fruit will not hold might try, as an experiment, girdling the tree with a wire drawn tight round the trunk, just when the fruit is setting. This will generally prevent the falling of the fruit. When the fruit is half ripe the wire can be taken off, and the bark will heal over in three months. (The *Journal of the Jamaica Agricultural Society*, December 1914.)

With reference to the dropping of breadfruit mentioned above, it may be stated that this appears to be similar to the dropping of the cotton bolls when, at certain critical times, the cotton plants experience a sudden change in the amount of moisture available, either an excess or shortage. In Barbados, it has been observed that breadfruit trees drop their young fruit if the supply of moisture becomes deficient at certain times.

In a short article in the *Canada-West India Magazine* for December 1914, it is pointed out that by no means the least important of the changes brought about by the opening of the Panama Canal, is the opportunity this will give to the West Indies for developing a profitable trade with New Zealand and Australia. Within a very short space of time it can be expected that ships from North America, and to some extent from Europe, will be making use of the new waterway en route to the Colonies in the Pacific, in which event they must pass by or near the West Indian colonies. With direct transportation facilities thus assured, or at least with ready facilities offering for transhipment at Colon to catch the outgoing steamers, the needs of Australia and New Zealand point to the fact that a profitable trade can be developed.

A new cane-cutting machine has been in operation during the last few weeks at the Clotilda plantation in Louisiana. It has been harvesting cane in a very successful manner, and those who have seen it have been very favourably impressed. The inventor, Mr. Luce, does not claim that the apparatus is at present perfect, but he believes that his machine, if built on its present lines, of high grade material, strong enough to withstand the heavy strains to which it is subjected, will be a success. He has up to now used cast iron and similar inexpensive material, avoiding the use of steel gears or similarly high-priced equipment. The result is that while his present machine works well, the gears occasionally break, but the substitution of steel will, he says, certainly obviate this disadvantage. (The *Louisiana Planter*, December 5, 1914.)

STUDENTS' CORNER.

The results of the Intermediate and Final Examinations in connexion with the courses of Reading in Practical Agriculture of the Imperial Department of Agriculture, which were held on November 23, 1914, are as follows:—

INTERMEDIATE EXAMINATIONS.

Centre.	Name.	Result.
St. Vincent	Simmons, F.	1st Class.
Antigua	Gallwey, A.	2nd ,,

Three candidates presented themselves for this Examination, one of whom failed to pass. The candidate from St. Vincent, who obtained a 1st class certificate, qualified in Cotton and Cacao as special subjects; the one from Antigua passed in Sugar Industry and Cotton, with a 2nd class certificate.

One candidate who sat for the Final Examination failed to pass.

The questions set in the Intermediate stage were published in the last number of the *Agricultural News*, with the exception of those on cacao, which are given below, followed by those set for the Final stage.

INTERMEDIATE EXAMINATION.

CACAO.

1. Describe in detail how you would proceed to establish a field of budded cacao.

2. Give a concise account of the fermentation of cacao.

3. How may the soil be dealt with, with a view to the control of root disease?

4. What are the different varieties of cacao cultivated in the West Indies? State their characteristics and relative merits.

5. Why is it that the cacao plant is especially susceptible to fungus diseases? State the tissues of the plant that are attacked and the kind of damage that is caused.

6. How many bags of cacao should be obtained from a 10-acre field planted 20 by 20? Express this in pounds, and calculate the value on the basis of the present market price in your district.

7. Put forward evidence to show that manuring cacao pays.

8. Indicate the nature and value of the work done on cacao estates out of crop time.

GENERAL SUBJECTS.—FINAL EXAMINATION.

A. PRODUCTION OF PLANTS.

1. Discuss broadly what is meant by the 'fertility' of an estate. What are the conditions which determine fertility or productiveness?

2. What are the main problems that have to be faced in your island as regard plant pests and diseases? What measures of control, direct and indirect, would you recommend for the ordinary estate? Give your reasons.

3. In choosing the location of an estate, what are the principal factors that you would take into consideration? Indicate their relative importance, and give reasons for your views.

B. PRODUCTION OF ANIMALS.

1. Discuss on broad lines the stocking of a West Indian estate. Indicate the steps that should be taken to secure the right quantity and quality of animals, and to maintain them in good condition and health.

2. What provisions should be made to secure an adequate food supply in order to maintain working animals in good health and efficiency? What housing arrangements are necessary, and what measures should be taken to protect the animals from infection by parasites?

3. Write a short essay on mule raising, having regard to the local bearing of the subject.

C. CONSTRUCTION ON ESTATES.

1. Describe the kind of buildings and their equipment, suitable for some West Indian agricultural industry.

2. Write an account of the engines and machinery used in some West Indian agricultural industry. Add a note on the supply of fuel in this connexion.

3. Explain the principles of road-making, both main and secondary. Indicate how these can be applied on the estate.

D. ECONOMICS OF PLANTING.

1. Give your views as to the amount of capital required for working an estate of any size and character you choose to select. Explain its apportionment, and indicate clearly that part which yields a direct profit.

2. Discuss, in particular instances, the advantages derived from the proper preparation and packing of estate produce. Mention the losses that follow from neglect in this respect.

3. What provisions should be made for the housing and maintenance of estate labourers? Why is this important? Refer to any special features of an estate which make it attractive to labourers, irrespective of wages and locality.

SPECIAL SUBJECTS.

CACAO.

1. What are your views as to the future of the cacao market? Indicate the future relation between production and consumption.

2. Write a short essay on the plant sanitation of a cacao estate.

3. What evidence can you put forward to show that the manuring of cacao pays? Explain a scheme of manuring suitable for any estate you are acquainted with.

LIMES.

1. In establishing a new lime estate, what provisions would you make for the preparation of various lime products, having regard to such products as raw and concentrated lime juice, citrate of lime, ecuelled and distilled oils, indicating which you consider it best to produce? Give your reasons.

2. How would you proceed to select and lay out the necessary land in order to have planted 150 acres of limes in three years?

3. What lime pests and their natural enemies predominate in your locality? Explain fully the measures adopted for the artificial control of these pests.

La Cuite or Pan Sugar.—Most West Indians know what 'pan sugar' is. Apparently something very like it is known in Louisiana as 'La Cuite'. The *Louisana Planter*, November 14, 1914, says that a considerable quantity of this delectable article has been shipped to New Orleans from Helvetia plantation for sale on the Sugar Exchange. 'La Cuite' is a product of open kettle sugar houses, where the sugar boiling is carried on with high heat. The concentration of the cane juice into syrup is carried on a shade beyond the normal crystallization point. The skilful 'cuite' boiler has to avoid the sudden crystallization of it into sugar. It was usually only made by the old Louisiana planters as gifts for special friends. Messrs. Hymel, the proprietors of Helvetia, are trying the commercial value of this delicious product.

FUNGUS NOTES.

COCO-NUT AND CACAO DISEASES.

COCO-NUT.

A general review of Professor Copeland's recent book on the Coco-nut, published in Messrs. Macmillan's series of monographs on tropical agriculture, appeared in the last number of this journal, and a review of Dr. van Hall's work on cacao in the same series appears on another page in the present issue. Each book contains a summary of present knowledge regarding the diseases of the plant which forms its subject, and these are of interest as affording a view of these diseases in broader perspective than is found in departmental publications.

The diseases of the coco-nut discussed in Copeland's summary are five in number. The stem-bleeding disease, due to *Thielaviopsis*, is known in Ceylon, India and Trinidad, but appears to be regarded as serious only in the first-named place. Apparently the author is not aware that *T. ethaceticus* is a synonym of *T. paradoxa*.

The leaf disease caused by *Pestalozzia palmarum* is quite general in its distribution. Only in isolated instances however, has it been reported as causing a serious epidemic, and its usual position is that of a weak parasite, only capable of advancing when the tree is weakened from some other cause.

The author refers to this fungus as the cause of a leaf disease, but in the West Indies it is known to produce a disease of the petiole also.

Evidence as to the existence of a specific disease due to Diplodia is given, but it is conflicting, and obviously in need of confirmation.

There remain the bud rots, which are adequately discussed. The evidence on this subject has more than once been reviewed in this journal, so that we need not follow the author in his summary of it. He recounts, however, his own experience in combating an epidemic in Luzon, in the Philippines, which is interesting as a record of an attempt to put the usual recommendation as to the use of fire into vigorous practice. The disease had existed for many years. In the badly infested districts there were patches where almost every tree was smitten, and larger areas where fully half the trees were dead or dying. The presence of a moist atmosphere was found to be the predisposing cause of the disease. Legislation was secured making the disease notifiable, and requiring, under penalty of fine or imprisonment, the destruction by fire of the crowns of affected trees. Three months after the campaign began (October 1908), a diseased tree had become an uncommon sight, and the new cases arising were less than one-tenth as numerous as they had been one year before. In 1913 the disease was still appearing, but very scantily, and at the present time is practically harmless. The author's conclusions are (1) that the best way of fighting bud rot is the destruction of the sources of infection, and (2) that attempts to save infected trees are at best a waste of time and effort

CACAO.

The diseases of cacao have been the subject of so much discussion that van Hall's opening remarks to the effect that their number is comparatively small is somewhat arresting. Its justification is seen, however, when we consider the effect which recent research has had, of reducing to the rank of saprophytes a large number of the fungi previously held to be parasitic, and the unification of others which had been regarded as distinct species. Thus the Nectrias are not even mentioned in the text, and the once complex Diplodia group is combined under *Diplodia cacaoicola*, a name which the author has preferred to Bancroft's *Thyridaria tarda*, on the ground of popular usage.

The author still regards die-back due to this fungus as a serious disease, but agrees with recent opinion that this is only the case where entry is afforded by wounds or unhealthy condition of the twigs, such as may be brought about by exposure. There is no doubt in the reviewer's mind that a very considerable amount of the damage still attributed to this disease is due to root troubles, or to the effects of wind or sun. The author is further doubtful as to the existence of a specific pod rot due to Diplodia (the 'brown rot' of West Indian writers), and in his experience has found it possible to prove that most of the pods bearing the fungus had first been attacked by Phytophthora. Nor does he accept the existence of a Diplodia (Thyridaria) root disease as established. His mention of the black root disease due to *Rosellinia* sp. must seem inadequate to anyone who has seen the very definite specific characters it displays in the field. It is true that its nature has not been established according to the rigid rules of proof—the same can be said of most root diseases of trees—but the manner of its spread and the constancy of its characters are decidedly convincing.

With regard to canker, the author states as a remarkable fact that the blackening of pods, and the canker of the stem and main branches do not at all occur side by side in the cacao fields, and instances that in Java several plantations suffer badly every year from canker, whereas black rot of pods is almost an unknown thing; conversely, in Kamerun, black rot is most serious, but canker is of no great importance. While accepting the current view that canker is due to Phytophthora, he lays stress on the great influence of cultural conditions on its incidence.

We turn with especial interest to the section dealing with the Surinam witch broom disease, attributed by the author to *Colletotrichum luxificum*, a connexion recently questioned by Rorer. The disease probably arose in the Surinam plantations by transfer from *Theobroma speciosum* which grows wild in the south of Surinam, and in the basin of the Amazon in Brazil.

The actual damage does not arise from the formation of the hypertrophied twigs from which the disease derives its name, but from the infection of the cushions, on which crowded and useless blossoms are then produced, and of the pods, which become hardened, and contain beans which are browned and spoiled. In this way the disease is said to be responsible for losses which may amount to nine-tenths of the normal crop.

The method of control adopted consists in removing and burning all the leaf-bearing branches, treating the wounds with tar, and spraying the remaining parts of the tree with 3 per cent. copper sulphate solution. It has been demonstrated that by this means the disease can be effectively controlled, though a watch has still to be maintained for fresh outbreaks, and precautionary spraying with Bordeaux mixture at least once a year is advisable.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of November.

The return of the spice and drug markets to their nearly normal conditions, together with the satisfactory amount of business that has been transacted during November, is a proof of the foresight of the Government, and the excellent services of the British Navy in protecting and keeping open our oversea trade routes, by which means our markets generally have been fairly well supplied. In the case of some products which come under our consideration, prices have advanced during the month, as in that of West Indian mace and nutmegs; while citric acid took a somewhat firmer position in the middle of the month, but dropped later. The following are the details.

GINGER.

It will be remembered that the spice auctions, this year, have been held only once a fortnight, instead of weekly as formerly. At the first sale on the 11th of the month the offerings amounted to 384 packages of Cochin and Calicut, all of which were bought in, fair brown rough Calicut at 26*s.*, and washed rough Cochin at 24*s.* per cwt. A fortnight later, namely on the 25th, the prices ranged from 33*s.* to 36*s.* for common, 40*s.* to 45*s.* for medium to good Jamaica, and 23*s.* to 23*s.* 6*d.* for Cochin.

NUTMEGS, MACE, PIMENTO, AND ARROWROOT.

There was a good demand for nutmegs at the first auction on the 11th, when the large number of 711 packages of West Indian were offered, and sold at the following rates: 61's to 70's, 5*d.* to 10*d.* per lb.; 72's to 82's, $5\frac{3}{4}d.$ to $6\frac{1}{2}d.$; 85's to 95's, $4\frac{1}{2}d.$ to $5\frac{1}{2}d.$; 118's to 129's, $4\frac{1}{2}d.$; and 132's to 140's, $4\frac{1}{4}d.$ to $4\frac{1}{2}d.$ All these prices showed an advance on previous rates. Mace was also in good supply and demand as the following prices will show, good West Indian being 1*d.* to 2*d.* per lb. dearer than it was last month. The following are some of the prices realized for the 200 packages sold: bold 2*s.* 3*d.* per lb.; good pale 2*s.* 1*d.*; fair 1*s.* 9*d.* to 1*s.* 11*d.*; ordinary 1*s.* 5*d.* to 1*s.* 7*d.*; red 1*s.* 4*d.* to 1*s.* 6*d.*; and common 1*s.* 4*d.* For pimento there has been a quiet demand, 2*d.* per lb. being the price asked in the early part of the month, but at the end of the month $2\frac{1}{2}d.$ was the quotation. At the end of the month fair manufacturing St. Vincent arrowroot was quoted at $2\frac{1}{2}d.$ per lb., and common at 2*d.* to $2\frac{1}{4}d.$

SARSAPARILLA.

This article has been in regular demand throughout the month, genuine grey Jamaica being quoted at 1*s.* 11*d.* per lb., and Lima-Jamaica at 1*s.* 8*d.*

CITRIC ACID, LIME JUICE, LIME OIL, KOLA, AND CASHEW NUTS.

At the beginning of the month citric acid was quoted at from 2*s.* 6*d.* to 2*s.* 7*d.* per lb. A fortnight later the demand had increased, with a rise of from 2*s.* 6*d.* to 2*s.* 8*d.* per lb., falling again at the end of the month to 2*s.* $6\frac{1}{2}d.$ Fair raw West Indian lime juice stood at 2*s.* 3*d.* to 2*s.* 4*d.* per gallon at the beginning of the month, but in consequence of fresh arrivals, and in anticipation of still further shipments, the month closed with a maximum price of 2*s.* 3*d.* West India distilled lime oil has been arriving in fair quantities, and at the beginning of the month was sold at 3*s.* 8*d.* per lb. A fortnight later it dropped to 3*s.* 3*d.* At auction on the 11th of the month 16 bags of dried West Indian kola were offered, and 8 were sold at $1\frac{3}{4}d.$ per lb. At the end of the month some good bright West Indian were offered, $3\frac{1}{2}d.$ per lb. being asked for them. At the last auction on the 26th, some 20 cases of shelled cashew nuts were offered, and bought in at 55*s.* per cwt.

INDIAN CORN.

A METHOD OF PLANTING.

In recent numbers of the *Agricultural News* seasonal notes have been given in connexion with selection of seed corn, and in the present issue it is intended to make reference to a method of planting which forms the subject of *Farmers' Bulletin*, No. 400, of the United States Department of Agriculture, entitled A More Profitable Corn Planting Method, by Mr. C. P. Hartley.

In the pamphlet entitled Indian Corn, which has recently been issued by the Imperial Department, it is stated that it makes little difference in the yield whether the plants stand singly in the rows, or whether they stand in hills with three or four plants to the hill, so long as there is a full stand of bearing plants to the acre. Mr. Hartley's experiments in corn planting lead to the conclusion that when corn is planted in hills, a much better yield may be obtained if the plants stand a few inches apart, that is to say, if the seeds are dropped a few inches apart instead of being dropped together, in one hole. This bulletin shows that each corn plant needs some 5 or 6 inches of root space on all sides in order to obtain a firm hold in the ground, and that when the plants of a hill are very closely bunched together, they are easily upset by the wind, and the roots of one plant interfere with those of the others.

The arrangement recommended is the planting of four seeds to the hill, these being placed with reference to each other as at the corners of a 5-inch square. It has been found that when corn is planted in this manner a better yield is generally obtained, and the plants are stronger against high winds.

For the experimental planting of corn in this manner Mr. Hartley used a board in which were inserted four funnels, placed as already described at the corners of a 5-inch square; a handle of convenient length for carrying the board was attached to its centre, and the kernels were dropped singly in each of the four funnels at each hill.

It was found that a minimum increase of yield of 2 bushels to the acre, or about a 4-per cent. increase, was the result of this method of planting. Mr. Hartley estimates that a planting machine arranged to drop the grain as described in these experiments would be paid for by the increase of yield in one year on a 50-acre crop of corn. A 4-per cent. increase in the value of the corn crop of Illinois for one year would amount to some $6,000,000.

Among other experiments that are almost certain to be tried in the West Indies in connexion with the cultivation of Indian corn, attention might well be directed to the matter of planting at different distances, and especially to the matter of spacing the plants in the hills or holes.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, December 15, 1914.

ARROWROOT—1¾*d.* to 4¾*d.*
BALATA—Sheet, 2/2; block, 1/10 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 72/- to 76/- per cwt.; Grenada, 69/ to 72/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £26 per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 14*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 2/3 to 2/9; concentrated, £28; Otto of limes (hand-pressed), 8/-
LOGWOOD—No quotations.
MACE—9*d.* to 2/3-.
NUTMEGS—4¼*d.* to 5¾*d.*
PIMENTO—Quiet.
RUBBER—Para, fine hard, 2/9½; fine soft, 2/6½; Castilloa, 1/9 to 1/10.
RUM—Jamaica, no quotations.

New York.—Messrs. GILLESPIE BROS., & Co., July 24, 1914.

CACAO—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11⅜c.; Jamaica, 10c. to 11c.
COCO-NUTS—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
COFFEE—Jamaica, 9¾c. to 13½c. per lb.
GINGER—7½c. to 10c. per lb.
GOAT SKINS—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $2·50.
LIMES.—$3·75 to $4·50.
MACE—45c. to 53c. per lb.
NUTMEGS—110's, 11¾c.
ORANGES—Jamaica, $2·00 to $2·50.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., January 4, 1915.

CACAO—Venezuelan, $13·50 to $14·00; Trinidad, $13·50 to $1400·.
COCO-NUT OIL—80c. per Impérial gallon.
COFFEE—Venezuelan, 11c. per lb.
COPRA—$4·00 per 100 lb.
DHAL—No quotations.
ONIONS—$2·80 per 100 lb.
PEAS, SPLIT—$8·50 per bag.
POTATOES—English $2·75 per 100 lb.
RICE—Yellow, $6·00; White $5·25 to $5·30 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., December 31, 1914, Messrs. T. S. GARRAWAY & Co., December 31, 1914.

ARROWROOT—$4·00 to $4·25 per 100 lb.
CACAO—$9·00 to $12·00 per 100 lb.
COCO-NUTS—$16·80.
HAY—$1·60 to $1·70 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·50 to $4·50 per 190 lb.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—Nova Scotia, $2·40 to $2·50 per 160 lb.
RICE—Ballam, $5·80 to $6·05 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·00 per 100 lb.

British Guiana. Messrs. WIETING & RICHTER, December 19, 1914; Messrs. SANDBACH, PARKER & Co., December 18, 1914.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	12c. to 14c. per lb.	12c. per lb.
CASSAVA—	96c. to $1·08	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$16 to $20 per M.	$23 per M.
COFFEE—Creole	——	16c. per lb.
Jamaica and Rio	14c. per lb.	16c. per lb.
Liberian	10c. per lb.	11c. per lb.
DHAL—	$5·25 to $5·75	$5·00 to $5·50 per bag of 168 lb.
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	4c.	——
PEAS—Split		$9·50 to $9·75 per bag. (210 lb.)
Marseilles	——	——
PLANTAINS—	24c. to 48c.	——
POTATOES—Nova Scotia	$3·00 to $3·25	$3·25 to $3·50
Lisbon	——	——
POTATOES--Sweet, B'bados	$2·40	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
TANNIAS—	$1·92	——
YAMS—White	$2·16	——
Buck	$2·40	——
SUGAR—Dark crystals	$3·35 to $3·45	$3·50
Yellow	$4·00 to $4·10	$4·00
White	$5·00 to $5·25	——
Molasses	——	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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Economic Changes.

THE profound economic changes caused by the present European war are bound to be world-wide in their effects, and to influence all phases of production, mechanical as well as agricultural. In many instances the effect will be an increase in values, and some places and some industries will derive increased profits from the reckless waste and the misfortunes of others. In other cases there will result a fall in values, from the inability to use certain commodities, and in consequence some districts will suffer, or be compelled to find other means of employment.

The influence alluded to is already felt in the West Indies in both ways. In some industries, notably those connected with sugar, cacao, and limes, there has already been an increase in prices; while Sea Island cotton affords an instance of a commodity adversely affected.

In consequence of all this, changes may be looked for, and these changes will doubtless leave a permanent impress on these islands, and result in the modification of their industries. In the case of those established industries, the products of which are increased in value, one will naturally look for the introduction of improvements in production or output, so as to enable them to meet the increased competition that may be expected when production in Europe begins to assume a normal condition again. One naturally thinks of sugar in this connexion, and would urge that the present is an opportune time to revive the questions of improved methods of manufacture, and the introduction of modern factories into those districts which are still dependent on the muscovado process. One outcome of the present disturbances and the changed political outlook, which will probably be beneficial, may be that those concerned will give these questions renewed consideration.

Similarly, in the cacao industry, there are contemplated improvements that have been set aside for a convenient season, which may perhaps have now arrived, such as the provision of better appliances for curing and drying, and improved methods of cultivation. In regard to this latter question, reference may be made to such matters as mulching, which is generally admitted to be beneficial, but which planters aver they have been deterred from undertaking because of the expense, and because of the number of labourers

required. The application of manures too, particularly of those that are likely to have long-lasting effects, and work in connexion with sanitation of the cacao orchards, such as the prophylactic spraying against fungoid diseases, may now have more consideration than has been expedient when prices showed a downward tendency. All such improvements as are possible now are calculated to strengthen the industry, and to enable the planters to face with greater confidence the increased competition that may assuredly be looked for.

As another instance where the products have risen in price in consequence of present disturbances, reference may be made to the lime industry. There is good reason to expect that those concerned with this will take advantage of the enhanced prices to improve their factories, and the methods of preparing their products for export, as for instance by the introduction of steam boiling and mechanical strainers, or of appliances for making citrate of lime. And, as in the case of cacao, increased attention may be given to the improvement of the cultivation of their lime orchards, especially with regard to restoring the fertility of the soil by means of manures.

When we come to consider those industries which are faced with a fall in the price of their product, the matter is more serious and urgent; the means of livelihood may be disappearing, and with them the means of adopting measures of protection. In most cases there is the possibility that the depression is but temporary, and that with a return to normal conditions the industry may fully revive. In pursuing a policy of waiting, however, the danger of overproduction should not be lost sight of; for, in the event of a commodity, such for instance as Sea Island cotton, being produced in considerable excess, and stored, there may result a depression in price that may be permanent, or at any rate extend over a very considerable number of years.

In such cases the temporary production of some readily grown and easily consumed crop will attract attention, a crop that may perhaps be set aside when a normal condition of things returns; or it may be found that the new crop has become permanently established from the result of exertions made under pressure of abnormal circumstances.

On the other hand, this pressure may induce planters to turn their attention to the establishment of what they hope may prove permanent industries of a kind not hitherto developed in their districts: and here again the pressure of hard times may apply a stimulus that may prove of lasting benefit.

The West Indian industry that presents the most obvious instance of temporary depression of price is that of the production of Sea Island cotton. Communities dependent on this are turning their attention to the production of food crops, with the double object of cheapening their own food supplies, and of having other commodities to dispose of. These efforts are resulting in much attention being paid to corn, which fulfils both of these functions, and it is anticipated that other food grains will receive similar attention. Various kinds of peas and beans may be instanced as crops that may well have consideration at such a time as this; and the experience of local planters and Experiment Station workers will be had recourse to in order to furnish information for immediate application. These grains present the advantage that, with suitable precautions, they made be stored for long periods; they may therefore be used for home consumption, or may be exported, as circumstances dictate.

Much attention is likely to be given in the communities referred to with regard to the production of root crops as well as grains. These for the most part labour under the disadvantage of not keeping for any considerable length of time, but in many instances they would find a remunerative market at no great distance.

This disability of root crops in the matter of keeping leads to the consideration of the question of converting them into meal. The best example, perhaps, of this is the conversion of cassava into 'farine', a useful food, well known in those West Indian islands that have come extensively under French influence. Much work has been done in efforts to produce such commodities as banana meal and sweet potato meal, but neither of these has yet found an extensive market.

The introduction of new industries likely to be of a permanent character usually presents difficulties on account of want both of knowledge and experience, alike in the case of those directing the enterprise, and of the work people who have to carry out details, and also on account of the difficulty in attracting capital, which in ordinary circumstances will be required to be locked up for some considerable time before a remunerative return is derived. The stress of unusual circumstances may, however, lead to the exploitation of new industries by means of the moderate amounts of capital that will have been accumulated during the prosecution of a successful industry, as exemplified by cotton.

In some districts attention is being drawn once more to fibre production. This is no new story in the West Indies, and will be received in many quarters in

a critical spirit. It may well be urged, however, that the success that is attending some ventures in this direction, and the changes that have taken place in recent years, both in the knowledge that has been acquired, and in the machinery that may be employed, may put matters in a more favourable light, and render it desirable to reinvestigate the position. In this connexion it may be added that the introduction of improved and efficient machines, capable of cleaning the fibre without the aid of water, and the introduction of oil engines as a source of power to drive them, have given new aspects to the question.

As long as the products of a district are remunerative, the inherent conservatism of producers militates against any changes being effected. But when economic pressure is felt, a change is very often necessary. Hence it is well for planters at this time to look ahead. Changes of a very far-reaching character in the products of the Tropics may occur in the near future. There are some striking remarks in this connexion in a book on the coco-nut, recently reviewed in the *Agricultural News*. First, in the introductory chapter, the author, Dr. E. B. Copeland, gives his opinion that the future of coco-nut raising is safe, and that he considers that the business is certain to continue for a term of decades to pay large profits. And secondly, in discussing the by-products of a coco-nut plantation, he remarks: 'there is no apparent reason why the Tropics should not develop a business in pork, lard, etc., the importance of which will be in some proportion to theease with which the feed of the hogs can be raised. I am satisfied,' he writes, 'that it is possible to raise hogs more cheaply in the Tropics than in any temperate country, and therefore expect to see the day when such products as pork, as articles of commerce, shall reverse their present direction of movement.' The idea of profitably raising supplies of meat, including beef, even for export, may therefore be worth consideration in some of these West Indian islands.

SUGAR INDUSTRY.

THE BURNING OF CANE TRASH.

The advisability of burning the trash left on the field after harvesting cane was the subject of correspondence a few years ago between agricultural experts in Louisiana and the officials of the Imperial Department of Agriculture for the West Indies. As is well known, the almost universal custom in the West Indies is to leave most of the trash on the field, and to plough it in subsequently. It was maintained by the Imperial Department that this practice was best suited to West Indian conditions on the ground that no practical lessening of insect attacks was found to result from burning, and that this practice caused the loss of the large amount of humus obtainable from the buried trash, which was of the greatest value to the soil.

From an article on the subject in the *Louisiana Planter*, December 19, 1914, by T. E. Holloway, of the Bureau of Entomology of the United States Department of Agriculture, it would appear that the Louisiana cane growers are beginning to doubt the wisdom of burning the trash. The writer gives, as the reason for this practice, the belief that in this manner the ravages of the moth borer especially, are largely checked. On the other hand, it would seem that the parasite, which kills the eggs of the borer, passes the winter in the trash on the fields; thus burning the trash tends to destroy this useful parasite. Experiments have been conducted by the writer of the article with a view of comparing results obtained as to freedom from borer attacks by the two methods. The canes on the experiment plots were reaped November 2 to 5, 1914, with the result that on the plot where the trash had been burned as usual, the infestation of canes by borer was nearly 84 per cent., while where the trash had been left on the field in the winter, and ploughed under in the spring, the infestation was only about 46 per cent. On another plantation, where similar experiments had been undertaken, the manager has determined to treat his whole estate in this manner this year. A like resolve is expressed from a plantation in Texas where the same trials had been made. The writer concludes: 'We find that ploughing under the cane trash in the spring has in every case reduced the number of canes bored. The injury due to the borer being reduced, it follows that more sugar is obtained, and more money secured for the crop.'

Perhaps the chief advantage which accrues to the West Indian plantation by leaving the trash on the ground is that it forms, when thickly spread over the field, a useful mulch helping to retain the moisture in the soil, and to keep down the growth of grass and weeds. This aspect of the question would not appeal so much to the planter in Louisiana, who leaves the trash on the field in winter; but the great advantage to him of ploughing it under in the spring is the addition to the soil of a large amount of organic matter which improves its condition.

THE DUTCH STANDARD.

In recent numbers of the *Agricultural News* (see Vol. XIII, p. 407, and Vol. XIV, p. 3) reference has been made to the Dutch Standard of colour as a basis for fixing the rates of import duties on sugar in Canada.

The following extract from Dr. H. C. Prinsen Geerligs's book, *Cane Sugar*, should be of interest as defining what the Dutch Standard really is:—

> The Dutch Standard (D.S.) consists of a series of samples of cane sugar, ranging from a very dark No. 7 to an almost white product No. 25. They are prepared every year by two firms in Holland under the supervision of the Netherlands Trading Society in sealed sample bottles, which are sent to the various merchants and Customs depôts. As these grades serve as standards for the different classes of sugar on which taxes are levied, it is important that sugar merchants should know exactly to which class the sugar belongs which they want to import; and, therefore, the sets of samples comprising the Dutch Standard are daily used for comparison in many countries which export cane sugar.

FRUIT AND FRUIT TREES.

SHIELD-BUDDING OF TROPICAL FRUITS.

The tropical regions of the world possess a multitude of distinct species of plants bearing edible fruits, but very few of them are really delicious to European taste. The standard fruits of the northern temperate zone have been for centuries subjected not only to culture, but to selective breeding, whereas until very recently hardly any attempt at selection, or hybridization, or asexual propagation has been made with most of the fruits of the Tropics. Considering the small amount of care bestowed on fruit trees in the West Indies for instance, the quality of the fruit produced is remarkable. But the work of selection needs more attention, together with the fixing of superior varieties by asexual propagation, especially by budding or grafting them on to inferior, but probably hardier species.

One meets now and then with a tamarind tree which bears pods sweet enough to be eaten raw with pleasure, or a cashew tree producing fruit of very much less astringency than is usual. If reproduction of such varieties is attempted by seed, years must elapse before the result can even be tested, and then the special quality desired may fail to have been secured. These instances have been selected from among the less sought after fruit, but the same thing occurs in fruit of higher type. A specially large and sweet golden apple, or a very fine avocado pear, or a particularly well flavoured guava, if the variety is wanted to be perpetuated, it can only be done with certainty by asexual propagation.

Some very important work has been done in this direction by officers of the Philippine Department of Agriculture. In Volume XII, No. 299, of the *Agricultural News*, reference was made to the work of P. J. Wester, as reported in the *Philippine Agricultural Review*, July 1913, on the possibilities of improving many of the varieties of the Anonaceae by bud grafting of superior kinds on to stocks of hardy, but tasteless species. In the same Review, September 1914, the same writer has another interesting article on recent experiments in shield-budding tropical fruits, which contains much valuable information for West Indian fruit growers.

As to experiments with the Anonaceae, it is found in the Philippines that the 'mamon' (*Anona palustris*, glabra), known to West Indians as the 'monkey apple', makes an excellent stock for the sugar apple (*A. squamosa*), and the much esteemed 'cherimoya' (*A. cherimolia*). The custard apple (*A. reticulata*) as a stock is very successful, while for that purpose the sour sop (*A. muricata*) does not seem so suitable.

Mr. Wester has also successfully budded the golden apple (*Spondias dulcis*, cytherecæ), called in the Philippines, hevi. His directions for this are as follows: 'In the hevi (golden apple) slender branches, 7 to 10 millimetres in diameter, with matured wood should be selected for bud wood. The hevi is a very rapid grower, and calluses quickly; the buds therefore should be cut large, not less than 4 centimetres long.' He has not apparently attempted the budding of the golden apple on to another species of the same genus. It might be well worth while to make experiments in this line in the West Indies. The hog plum (*Spondias lutea*) is of very vigorous habit, and might prove a useful stock for the golden apple, with a view to producing an improved variety of that deliciously flavoured fruit, which might be freer from objectionable spiny fibres, which at present militate against the appreciation of its flavour.

The budding of the avocado pear, for reproducing superior varieties, has been practised for some time; but the budding of the guava appears never to have been carried out successfully before Mr. Wester's experiments. He seems to have proved that this operation had better be attempted during the winter months. The stocks should be treated as early as their size permits, and as near the ground as convenient, for the reason that they send out shoots of their own very persistently, and these are apt to retard the growth of the scion, if the buds are inserted too high above the ground. If the buds are inserted into old stocks they sprout with difficulty. The bud wood should be sufficiently mature for all the green colour to have disappeared from the bark, and the buds should be cut from 2·5 to 3 centimetres long. In all these budding operations waxed tape should be used for tying the bud in.

There appears to be a field for very interesting investigation and experiment in this direction. Results cannot be obtained at once, but anyone whose inclination leads him to make trials in budding or grafting tropical fruit may very probably hit upon a line on which in the future some really good fruit may be evolved from things which at present can only be termed edible.

MONTSERRAT PINE-APPLES IN CANADA.

The Curator of the Botanic Station, Montserrat, has forwarded correspondence and account sales relative to a shipment of pine-apples from that island to Canada.

The shipment consisted of 8 crates containing 144 pines. Of these, 118 were sold, about a dozen were in hand not sold, and some fourteen were not accounted for at the time of writing.

These 118 pines sold for $20·33. The total charges were $6·94, leaving a net balance on the shipment of $13·39, with twenty-six pines not sold or accounted for. If these last are omitted, and the net proceeds be reckoned as from the whole number of 144 pines, the price per pine in Montserrat works out at about $4\frac{1}{2}d.$ each, from which to meet the cost of growing, harvesting, delivery to shipper, packing, and crates, as well as the profits of shipper and grower. The Curator estimates, however, that when this figure can be obtained, pines can be grown at a profit on suitable lands.

It is of interest to note that this shipment consisted of unripe pines forwarded in ordinary hold stowage, and of others somewhat riper in cold storage. These latter arrived at their destination in a less satisfactory condition than those sent under the ordinary hold condition.

A criticism of the Montserrat pine is that it is not sufficiently showy, although its flavour is reported to be excellent. It seems that pines are still sold largely on their looks, and that large, stocky fruit of bright colour, and possessing good, well proportioned, leafy tops, are attractive to the consumer, even though the flavour is not equal to the more slender, less highly coloured Montserrat pine, with its small top.

It might be advisable for the Montserrat grower to make trials of the Red Spanish variety for shipment to Canada, and to continue to grow the Ripley type for special markets.

There are about 180,000 acres planted in citrus fruits in California. There are about 8,000 citrus growers, the average holding being about 20 acres. The annual shipment is now about 14,500,000 boxes, approximately one-sixth of the world's supply. (From Circular No. 121 of the University of California, College of Agriculture.)

CASSAVA POISONING.

Several years ago the Imperial Department of Agriculture issued a leaflet containing Hints and Information in regard to Cassava Poisoning.

There have recently been several deaths from cassava poisoning in Barbados, and as this probably happens every year in one or another, or perhaps in all the other West Indian Colonies, it may be of general interest to refer again to the subject in these columns.

The notes which follow are taken from the leaflet already mentioned, and they include the greater part of its contents.

CASSAVA POISONING.

There are two kinds of cassava known in the West Indies. These are the 'bitter' and 'sweet' cassava. Both are largely grown, and in some localities the roots afford an important article of food. The roots of the bitter cassava are usually grated, and the milky juice is washed out, leaving a coarse flour from which cassava cakes are made. In many parts of the tropics cassava flour, known as farine, is eaten cooked or heated on plates and made into tapioca. The roots of sweet cassava are more commonly eaten as a vegetable after they have been boiled or roasted. There are so few differences to be observed between the plants yielding bitter and sweet cassava that children and inexperienced persons may easily take one for the other. Usually the peasants are fully aware of the distinction between them.

It is well known that the fresh roots of the bitter cassava are poisonous. If eaten raw, or in a half-cooked condition, they contain prussic acid, and numerous deaths which are due to this cause, are recorded every year in the West Indies.

The object of this leaflet is to bring prominently under general notice, not only the poisonous character of bitter cassava, but the fact that some kinds of the sweet or roasting cassava (especially from old plants) have been found to be injurious, if not fully or properly cooked.

HOW TO PREVENT CASSAVA POISONING.

Although the sweet or roasting cassava is not so poisonous as the bitter cassava, it would be safer to let it be widely known that **no kind of cassava should be eaten without being carefully and thoroughly cooked.** In preparing cassava for table, it is important to bear in mind that what poison is present lies mostly near the outside of the root. It is desirable, first of all, to scrape off the skin and the outer portion of the root, so as to remove the greater part of this poison. In the second place, the roots should be **carefully cooked right through,** so as to drive off any remaining portion of the poison. Further, it would be advisable not to eat cold cassava, or cassava that has been allowed to stand for some time after being cooked.

The rules to be followed in preparing cassava of any kind for table, would be as follows:—

1. Scrape the roots, and remove the outside parts.

2. Cook the cassava well, and be sure it is well coooked throughout.

3. Eat cassava only after it has been freshly cooked.

WHAT TO DO FOR CASSAVA POISONING.

If a person after eating cassava feels or looks ill, medical aid should be obtained at once without any delay. That is to say, **the doctor should be called,** or the patient should be taken to the doctor, or to the nearest hospital, dispensary, or almshouse, where medical aid can be obtained, **as soon as possible.** A few minutes may make all the difference, and no time should be lost. The doctor can inject some medicine under the skin of the arm which may save the patient's life. **Therefore lose no time.**

While waiting for the doctor to come, or for the cart or trap to take the patient to the doctor, there are several important things to be done which anyone can do. The following things should be done:—

1. Place the patient in the open air, or near the open door of the house.

2. Make the patient vomit by tickling the back of the throat with a finger, a feather, or a piece of grass, and, if he can swallow, make him drink water at intervals after each vomit, so that the stomach is washed out thoroughly. If he does not vomit freely, get someone to mix a tablespoonful of 'ground' mustard in a tumbler ('half-pint glass') of warm water—(for a child, a teaspoonful of mustard in half a tumbler of warm water) **and make him drink it off.**

3. If the patient begins to get insensible or 'lifeless', take the clothes from the upper part of the body, and pour a large stream of water out of a jug or bucket from a height of three or four feet on to the back of the head, the spine, and chest. **This should never be left undone.**

4. Afterwards dry the body with a rough towel or any coarse garment, and put on some dry clothes and blankets, shawls, or anything to keep him warm. Continue to rub the arms and legs *briskly* to keep up the circulation. If he gets cold, put some bottles filled with hot water round about him.

5. All this time hold 'smelling salts' to his nostrils every now and then.

6. As soon as the stomach is empty, and nothing but water comes up when he vomits, give a strong dose of rum, whisky, or brandy diluted with twice as much water; and if it comes back at once, repeat the dose.

7. If anyone near by knows how to carry out what is called 'artificial respiration', it should be done if the patient gets very bad, and stops breathing.

Those in charge of persons suffering from cassava poisoning should not despair. Some of the worst cases have recovered after energetic treatment. Remember that the patient's life is at stake, and there is no time to consider whether 'wetting him will give him a cold', or any idea of that kind. What is recommended above should be done without fail.

The Royal Sugar Commission announces that as some misapprehension appears to have arisen with respect to the action of the Royal Commission in reducing the price of Mauritius crystals, it may be as well to state that the reduction is confined to sugar of that class when sold as a material of manufacture. The concession has been made for the special reason that with sugar so used, the recovery from the consumer of the increase in the cost of sugar is a much more complicated and difficult matter than it is when sugar is used for grocery purposes. The Mauritius crystals held by the Commission will, for the present, be reserved exclusively for the use of manufacturers: and there is no intention of making a change in the prices of other classes of sugar at the disposal of the Commission, unless or until some material change occurs in the condition now ruling.

COTTON.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended January 9, is as follows:—

The market was quiet throughout the week with only a demand for the moderate offerings of Fine off in colour on northern account. For Fine, Fully Fine, and Extra Fine, Factors show no disposition as yet to concede from their asking prices, thinking with the limited supply, they may in time succeed in obtaining them.

The crop lots are still being held much above the views of buyers.

We quote, viz:—

Extra Fine	23c. =	13½*d.*,	c.i.f. & 5 per cent.
Fully Fine	20c. to 21c. = 12*d.*	to 12½*d.*,	„ „ „ „
Fine	18c. = 11*d.*		„ „ „ „
Fine off in colour	16c. = 10*d.*		„ „ „ „

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester, and Havre, up to January 9, 1915, were 50, 1,012, and nil bales, respectively.

Mr. J. L. Fonda, cotton expert representing the Fine Spinners Association, whose visit to the West Indies has already been referred to in the columns of the *Agricultural News*, returned to Barbados after having visited most of the islands where Sea Island cotton is grown as an important crop.

Mr. Fonda addressed a special meeting of the Barbados General Agricultural Society on January 26.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 11, 1915, with reference to the sales of West Indian Sea Island cotton:—

Since our report of December 12, 1914, about 50 bales of West Indian Sea Island have been sold, chiefly Fine Nevis 14*d.* to 15*d.*, and a few Montserrat at 14*d.* Both new crop.

Until there is some prospect of a termination of the war, we only expect an occasional enquiry, unless holders are disposed to accept about 12*d.* per ℔., when large consumers might be willing to augment their stocks.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture proceeded to St. Vincent on an official visit by the S.S. 'Chaudiere' of the Royal Mail Canadian Line, which left Barbados on January 27. It is expected that Dr. Watts will remain in St. Vincent about a fortnight, returning to Barbados on or about February 9.

Mr. W. R. Dunlop, Scientific Assistant on the staff of the Imperial Department of Agriculture, returned to Barbados by the R.M.S. 'Trent' on January 27, after three months' leave of absence in England.

REPORTS ON DOMINICA RUBBER.

The Curator of the Botanic Gardens, Dominica, has forwarded a report received from the Imperial Institute, on samples of Dominica rubber, which formed a part of the Dominica exhibit at the Rubber Exhibition held in London in July, last.

There were three samples of Para rubber, and one of Funtumia in this lot.

The Para rubber is described as follows: No. 1. Para biscuits. Thin biscuits of pale rubber, clean and well prepared. The rubber was of good appearance, but rather soft and deficient in tenacity. Many of the biscuits were firmly stuck together.

No. 2. Para biscuits, 2nd quality. Thin biscuits varying in colour from pale to light brown, and not of such good appearance as the preceding sample. The rubber was soft and deficient in tenacity. Many of the biscuits were firmly stuck together.

No. 3. Para rubber (smoked). Thin biscuits of dark brown rubber having a strong smoky odour. The physical properties were a little better than those of the preceding samples, but the rubber was still rather weak.

The results of examination are given below:—

	1 Per cent.	2 Per cent.	3 Per cent.
Loss on washing (moisture and impurities)	0·3	0·2	0·4
Caoutchouc	93·5	94·2	93·4
Resin	3·5	3·3	4·4
Proteid	2·7	2·2	2·0
Ash	0·3	0·3	0·2

The commercial valuation is thus given: No. 1. About 2*s.* 1*d.* per ℔. in London, with first quality biscuits at 2*s.* 4*d.* per ℔. No. 2. About 2*s.* 0*d.* per ℔. in London, with first quality biscuits at 2*s.* 4*d.* per ℔. No. 3. About 2*s.* 3*d.* in London, with first quality smoked biscuits at 2*s.* 6*d.* to 2*s.* 7*d.* per ℔.

'These three samples of Para rubber from Dominica are very satisfactory in chemical composition, containing from 63·4 to 94·2 per cent. of caoutchouc. In physical properties however, the rubber is not so good, being rather soft and weak, and in this respect the specimens are a little inferior to the previous samples of Para rubber from Dominica examined at the Imperial Institute (see Imperial Institute reports dated February 10, 1909, and February 15, 1912).'

The sample, No. 4, Funtumia rubber, is reported upon as follows:—

No. 4, Lagos rubber. Thin rough biscuits of light brown rubber, clean and in good condition. The physical properties of the rubber were excellent.

The results of the examination are given below:—

Loss on washing (moisture and impurities)	1·2 per cent.
Caoutchouc	84·6 „ „
Resin	8·8 „ „
Proteid	6·4 „ „
Ash	0·2 „ „

The commercial value of this sample is given as about 2*s.* per ℔. in London at the present time (November 1914).

'This rubber contains rather large percentages of resin and protein, with the result that the amount of caoutchouc in the dry rubber is only 84·6 per cent. Its physical properties are, however, very satisfactory, and similar rubber would always be readily saleable.'

REPORT ON THE BOTANIC AND EXPERIMENT STATIONS, ST. KITTS-NEVIS, FOR THE YEAR ENDED MARCH 31, 1914.

From the report of the Superintendent of Agriculture for St. Kitts-Nevis, which has just been issued, it appears that the weather conditions during the year under review have been not altogether so unfavourable as in the previous year, the rainfall having been slightly above the average of the past twelve years. The distribution of the fall was somewhat unusual, the months June, July, and August having been abnormally dry. The gardens of the Botanic Station have been maintained in condition, and present a good appearance.

As in the year before, there has been very little demand from the nurseries for economic plants such as cacao and limes, no extension of the cultivation of these having taken place. On the other hand, there has been a considerable demand for palms and other plants for ornamental purposes, which has been met from the gardens.

EXPERIMENTS WITH ECONOMIC PLANTS.

The series of plot experiments with sweet potatoes, yams, and cassava, which have been steadily conducted for the past ten years, must yield valuable information for the cultivation of these root crops. The table of results of such a long-continued series of experiments deserves careful attention, showing as it does the great variation in yield of the several varieties experimented with. Experiments too, with ground nuts, onions, maize, and Guinea corn are being continued. It is interesting to note that a variety of Guinea corn, new to the smaller West Indian islands, called 'Mazagua', appears to be giving very good results, the corn obtained being distributed to planters for more extended cultivation. The experimental cultivation of tobacco yields good results; and the horse bean as a green dressing has proved of value. Experiments as to the effect of various manures in the cultivation of pine-apples are being continued.

WORK WITH COTTON.

For ten successive years identical manurial experiments in cotton cultivation have been conducted at La Guérite. The same conclusion continues to be drawn, that under conditions prevailing in that locality, the application of manures to the cotton fields is not remunerative, although it is interesting to note that for the last two years, the long-continued application of these fertilizers to the land appears to have resulted in a slight increase of yield. Some experiments in hybridization of cotton, which had been begun in the past, have been now definitely abandoned, as they do not seem to be likely to lead to the production of a variety superior in any way to the one at present cultivated. Some seeds of a variety with exceptionally long fibre, which were recently received by the Superintendent of Agriculture, have been experimentally planted, and will receive careful attention. Particularly good work seems to be done in this Station as to cotton seed selection, a point of the utmost importance, if the high standard of excellence of St. Kitts cotton is to be maintained.

PLANT PESTS AND DISEASES.

With regard to pests of the sugar-cane, St. Kitts does not seem to have been very seriously affected during the year under review. It does appear, however, that the grub of *Exophthalmus esuriens* is capable of inflicting a good deal of damage as a root borer. Precautions should be taken at once against this enemy. Some years ago termites badly attacked the canes in one district, but the methods of destruction advised by the entomologist of the Imperial Department of Agriculture having been employed, this pest seems to have been adequately controlled.

By the use of preventive measures, the damage done by the cotton worm this season has been very much lessened. In some districts a leaf disease, which appears to be similar to what is known in the United States as leaf-cut disease or tomosis, made its appearance. The leaf-blister mite has been troublesome only in fields which are near to others on which old cotton plants have been allowed to remain. This reprehensible practice should certainly be discontinued.

PROGRESS IN THE CHIEF INDUSTRIES.

Owing to improved weather conditions, the sugar crop was a fairly good one, surpassing the estimates. The output of the Central Sugar Factory was very satisfactory. The results of the work on the Experiment Station with varieties of sugar-canes, and with regard to the effects of various manures in sugar-cane cultivation, form the subject of a separate and detailed report.

On most estates in St. Kitts, cotton forms a rotation crop with cane. The crop this season is the largest yet recorded, and the product has maintained its reputation for a high standard of excellence. In order to avoid any lowering of this standard by the admixture of possibly inferior cotton grown in other islands, and sent to St. Kitts to be ginned, it has been decided that the separation of such cottons shall be very stringent, and that bales of really locally grown cotton shall be conspicuously marked, 'grown in St. Kitts'.

There was an interesting local agricultural show in St. Kitts in the year, and an exhibit of agricultural produce was sent from that island to the Canadian National Exhibition in Toronto.

The work of instruction in Agriculture Science at the Grammar School seems to be very efficient. The results of the Cambridge Local Examinations in this subject are specially gratifying.

AGRICULTURAL AFFAIRS IN NEVIS AND ANGUILLA.

Appended to the Superintendent of Agriculture's report there is the report of the Agricultural Instructor in Nevis, on agricultural matters in that island.

The cotton crop seems to have been a fairly good one, but there also, as in St. Kitts, mischief has been wrought in some places by the presence of diseased, old cotton plants, which were allowed to remain in neighbouring fields. Increasing interest is being shown in the cultivation of coco-nuts in Nevis. Experiments with regard to various food crops are being continued, which are certain to prove of value.

In the body of the report, the Superintendent of Agriculture refers to the cotton crop in Anguilla. In spite of the dryness of this season, the crop has been a fairly good one, and there is no doubt that the cultivation of cotton has done very much to ameliorate the conditions of life in that small island.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.; West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

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Agricultural News

VOL. XIV. SATURDAY, JANUARY 30, 1915. No. 333.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number treats of economic changes likely to take place in the West Indies, and gives some hints as to possible new industries.

On page 35 there is an abstract of an article from the *Louisiana Planter* on the question of burning cane trash on the field.

Under the heading Fruit and Fruit Trees will be found some hints on shield-budding of some tropical fruits.

On page 37 is reproduced a leaflet, issued sometime ago by the Imperial Department of Agriculture, with regard to cassava poisoning.

The Insect Notes in this number contain a summary of the account of the insect pests of coco-nuts given in Copeland's book reviewed on page 5 of the present volume of this publication.

On page 46, Fungus Notes contain an account of two diseases of beans, and some notes on the citrus canker in Florida.

The article on page 47 is an abstract of the manner of dealing with devil's grass when used for making lawns in India.

The Panama Canal and the British West Indies.

The editor of *Tropical Life* has devoted the supplement to the number of that Journal for December 1914 to the following subject: 'Panama and prosperity—the mistake of thinking that the British West Indies will not benefit.' The object of the article is evidently to direct the attention of the British public to the West Indies, and their still undeveloped resources, and to the certainty that the opening of the Panama Canal will afford extended opportunities for a wide expansion of trade in West Indian products. The Panama Canal must undoubtedly favourably affect the future prosperity of the West Indian islands, and bring increased wealth to them for several reasons. Firstly, lying as they do in the direct route to and from the Canal, they are bound to benefit as entrepôts, coaling stations, and refitting harbours. Secondly, they must derive advantages by the opening of a direct traffic in tropical produce, with the western coast of the United States and Canada, Australasia with its increasing chocolate manufactures, as well as Japan and China. Thirdly, the traffic to and fro that will result from the opening of the Canal, must add to the importance of the industries carried on already in these islands, and possibly add to those industries profitable new ones, such as the growing of fresh vegetables, poultry raising, maize cultivation, cattle and hog breeding, etc. Already the demand for such foodstuffs exceeds the supply.

In conclusion, West Indians may well feel grateful to the editor of Tropical Life for this renewed effort to direct attention to their islands by this interesting article, illustrated as it is by excellent photographs.

Stock Poisoning Due to Scarcity of Food.

From time to time instances are reported in the West Indies of animals being poisoned by some plant growing in their feeding grounds. There are so many deleterious, and even violently poisonous plants common enough in the Tropics, that one wonders that fatal accidents to stock are not more frequent. In *Farmers' Bulletin*, No. 536, of the United States Department of Agriculture, the matter is summarized in a handy form. The writer, C. D. Wight Marsh, of the Bureau of Plant Industry, comes to the conclusion that stock seldom eat poisonous plants by choice, but only when they are induced or compelled to do so by the scarcity of other food. If the owners of stock will recognize this fact, they will reduce their losses from this cause, by taking a few precautions.

(1) Stock should not be turned out to graze where there is little to eat except possibly poisonous plants.

(2) From any area known to be infested with poisonous plants stock should be kept away. This is especially necessary when on the general pasture land grass has not started to grow, or when it has been over grazed.

(3) If it is necessary to drive stock through a locality infested with poisonous plants, care should be taken that they are not hungry when going through the locality.

Candle-nut Oil.

The Candle-nut tree, *Aleurites triloba*, has been long naturalized in some of the West Indian islands, having been introduced from its native habitat, the Malay peninsula. This species, and other species of the same genus yield a drying oil, which is used in water-proofing processes, in making varnish, linoleum, rubber substitutes, etc. Enormous quantities of this oil are exported to Europe and America. In the year 1910 as much as 100,000,000 lb. of oil obtained from *A. Fordii*, valued at £800,000, were exported from Hankow; while from Outcheon, during the same year, there was exported 7,000,000 lb. of oil obtained from *A. montana*. This latter species is limited to the subtropical regions of South-west China, while *A. Fordii* belongs to the warm temperate regions of the Yangtse basin. There is another species found in Japan, *A. cordata*, which yields an oil also.

It may be of interest in connexion with this subject to remark that one of the species referred to above, viz. *A. Fordii*, has been recently introduced into several of the Botanic Gardens in the West Indies.

Vanilla Cuttings.

With reference to the article on vanilla cultivation, which appeared at page 402 of Volume XIII (see the issue for December 19, 1914) of the *Agricultural News*, an interesting communication has been received from Mr. Joseph Jones, Curator of the Botanic Gardens, Dominica, which should be of use to cultivators. He points out that the method of planting vanilla cuttings as described in that article, is not quite in accordance with the practice found most successful in Dominica, according to Mons. Joly, who has charge of the vanilla cultivation at Canefield estate in that island. Two or three of the lower joints of the cutting should be lightly covered with mould, on which a stone may be placed to hold the cutting in position. But a very important point is that the 'end of the cutting should always project above the ground.' The reason given is a good one: 'When the end of the cutting is covered, decay often sets in, which continues along the stem, and prevents the part below-ground from making strong roots. This results in the death of the lower portion. Vanilla is a plant hard to kill, but the placing of the end of the plant in the ground is about the speediest means of effecting its death.' For the same reason the following seems also to be a good direction. 'The leaves on the portion of the stem covered with mould should remain attached, and no wound should be made on the part below-ground.' It must be remembered that the roots of the cutting take their rise from the axils of the leaves.

Mr. Jones also says that it is considered desirable by experts to 'quail', i.e. slightly to wither the cuttings in the shade for twelve or fourteen days before planting.

It is gratifying that the above-mentioned article in the *Agricultural News* has evoked this practical comment of a man who has experience in vanilla cultivation in the West Indies. Any such notes and comments would always receive careful attention from the Imperial Department of Agriculture.

The Poison in Cassava.

In connexion with the article on cassava poisoning which appears on page 37 of this number of the *Agricultural News*, it may be of interest to refer to the nature of the poison which exists in the roots of the cassava plants.

An article in the *Bulletin of the Imperial Institute*, Vol. IV (1906), p. 329, entitled Cyanogenesis in Plants, gives an account of the production of prussic acid in plants.

Among the well known plants which have this property of producing prussic acid in their tissues are the bean (*Phaseolus lunatus*), Sorghum or imphee (*Sorghum vulgare*), the Lotus (*Lotus arabicus*), cassava (*Manihot utilissima*), flax (*Linus vulgaris*), and others.

The organic compound which contains or gives rise to prussic acid in plants is some form of glucoside. In cassava, as well as in the bean and others, this is known as phaseolunatin. It was at first thought to occur in the bitter cassava only, but is now known to be present, at times at least, in the sweet varieties also.

West Indian Permanent Exhibits in Canada.

A permanent West Indian Exhibit has been opened in Toronto, which, it is contemplated, will be extended to Montreal, Winnipeg, and other Canadian cities.

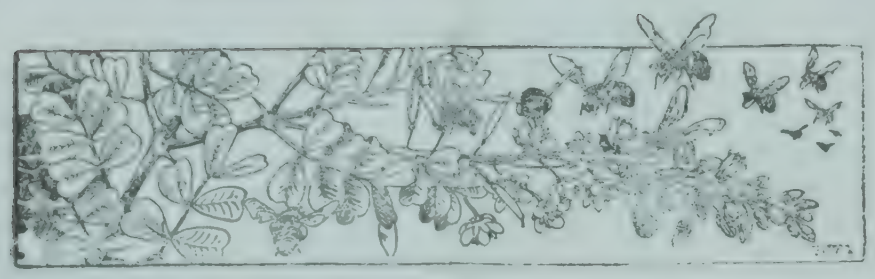
This scheme of Permanent Exhibits is an attempt to supplement the good work of the Toronto Exhibition by providing one or more centres, where West Indian products are shown and offered for sale, and where inquiries may be made and answered with regard to business in West Indian products.

The promoters state that 'the exhibit forms a retail depôt where we can get in touch with the actual buyers, and sell to them direct. The location is in the heart of the city, and we have a fine up-to-date establishment with a large electric sign, etc. The whole exhibit is considered a great credit to the British West Indies in every way. We shall sell only the best of produce, and the prices, of course, must be low enough to sell satisfactorily.

'The great drawback of the exhibit at the Toronto Exhibition has been the fact that there is no one to follow up the inquiries, and we hope to fill the deficiency.'

The success of the Jamaica exhibit at Toronto for the past few years, and the inquiries that have been made for the products of that Colony seem to have led to the establishment of the Permanent Exhibit, and at the present time the goods on hand are largely from Jamaica. It may however be well for the exhibition committees of all the British West Indies and British Guiana to get into touch with this enterprise, as affording a means of establishing a closer relationship between producer and consumer in the matter of tropical produce in the northern markets.

Additional information may be obtained from Mr. Lewis W. Clemens, West India Permanent Exhibits, 71 King Street West, Toronto, Canada.



INSECT NOTES.

INSECT PESTS OF COCO-NUTS.

In the first number of the present volume of the *Agricultural News*, two books have been reviewed which deal with important crops of tropical countries. One of these, *Coco-nuts*, by Copeland, was reviewed at page 5; the other, *Cacao*, by van Hall, at page 20. Each of these books contains a summarized account of the diseases and pests of these crops, respectively. The accounts of the fungoid diseases were reviewed briefly in the last issue of this journal (see page 30). The present issue contains a summary of the account of the insect pests of coco-nuts; that referring to those of cacao will appear in the next number of the *Agricultural News*.

COCO-NUTS.

The principal pests of coco-nuts are the black or rhinoceros beetle (*Oryctes rhinoceros*), and the red beetle, or Asiatic palm weevil (*Rhynchophorus ferrugineus*).

Oryctes rhinoceros is a shiny, dark-brown or practically black beetle, ranging in length from 30 to 60 mm., with the usual size between 40 and 50 mm. The male is the larger, and is also distinguished by the prominent horn on the dorsal surface of the head, which in this sex is sometimes as much as one centimetre ($\frac{2}{5}$-inch) in length, while in the female it is smaller, often inconspicuous. The life-cycle probably varies in length, certain writers on the subject (Copeland amongst these) believing that in some cases it may not occupy more than seven months, while others hold the opinion that the larval life alone may extend over a period of two years.

The eggs are not described. The larvae reach a length of 1 decimetre (about 4 inches) when they enjoy particularly favourable conditions. The larvae live in decaying vegetable matter of all kinds, and the cocoons are formed in the same situations.

The injury to coco-nut trees is caused by the adult beetles, which eat their way into the bud, starting at the bases of the leaves.

The means of controlling this insect are the destruction of the beetles in the tree or their removal by the use of a wire probe; the destruction of their breeding places by the removal of all accumulations of rubbish; and by means of traps, which consist of holes filled with specially prepared vegetable refuse and mould, which furnish satisfactory breeding places, these being regularly examined, and the beetles, cocoons, larvae, and eggs collected and destroyed.

This last method is believed to be the most effective means of controlling the black beetle References to this beetle have been made in the *Agricultural News*, Vol. XI, pp. 218 and 378, and Vol. XIII, p. 10. The last of these gives an account of the successful use of a parasitic fungus in the beetle traps, which kills many of the larvae.

The red beetle, or Asiatic palm weevil (*Rhynchophorus ferrugineus*) is related to the West Indian palm weevil (*R. palmarum*), and attacks coco-nut trees in the same way. The red beetle is said to be the most deadly insect pest of coco-nuts in the Philippines, but since it cannot attack sound trees, it is not the hardest to combat.

Its length ranges from about 3 to more than 5 centimetres ($1\frac{1}{5}$ to 2 inches). Its colour varies from reddish to almost black. It attacks the coco-nut and other palms, but is not known to infest plants of other groups.

The length of the life-cycle is variously estimated to cover a period of from ten weeks to about one year.

The red beetle is not able to penetrate into the tissues of a healthy coco-nut tree, but takes advantage of injuries of all sorts, which result from any breaking of the surface. The holes of the rhinoceros beetle, wounds resulting from hurricanes, fires, careless or unnecessary pruning, all offer means of access to the egg-laying female.

It has been found that the removal of old leaves, and the firing of the tops in an attempt to check other insects or disease, result in attack by this pest.

The methods of combating this insect include, (1) all precautions against injuring the coco-nut tree, in which, of course, the control of the rhinoceros beetle plays an important part; (2) the removal and destruction of all infested coco-nut or other palm trees; (3) extracting the beetles and larvae from their burrows and places of concealment in the tree; (4) the use of bait and traps, which consists in the felling and leaving exposed on the ground, under suitable conditions, of any dead coco-nut or other palm known to be attractive to the insect, until eggs have been laid in them and the larvae have hatched, when the trap material is destroyed, preferably by fire. Mangoes crushed in coco-nut milk and water, and exposed in shallow dishes are also said to have been recommended as a trap. The use of poisons, such as carbon bisulphide, cyanide of potassium, and hydrocyanic acid has been tried for the control of this insect, but without practical results.

A number of other beetles, including some weevils, are also mentioned as being pests in the East, and reference is made to those which occur in the American tropics.

The most serious leaf-eating beetles mentioned are small beetles of the family Hispidae, which both as larvae and adults feed upon the leaves, and are the cause of serious injury to the trees.

One of these, *Bronthispa froggatti*, is stated to be considered by Froggatt as certainly the worst pest the planters in the Solomon Islands have to fight in their young coco-nut plantations. The result of the attack is that the leaves are reduced to skeletons connected by dead membranes before they are well unfolded. In Eastern Java the same, or a nearly related species, attacks the coco-nut leaves in a similar way. In the Solomon Islands gangs of boys are kept at work shaking soap and kerosene wash into the still folded leaves.

In the related genus, Promocotheca, three species are known as coco-nut pests: *P. cumingii* in the Philippines, *P. antiqua* in New Guinea, and *P. opicicollis* in the New Hebrides.

The Philippine species is a small beetle from 7·5 to 10 mm. in length. It is sluggish in habit, and does not fly readily on being disturbed.

The adult beetles crawl between the folded-up leaflets of the young leaf, and eat small spots between the veins of the leaf.

The damage done by the larva is greater than that done by the adult. The eggs are inserted by the adult female just beneath the epidermis of the leaf. The larvae, on hatching, denetrate into the tissue where they feed, and pupate later. The spots eaten by the beetles, and those excavated by the

larvae, become dry and discoloured when the leaf opens out, and give to a badly attacked tree a very unsightly appearance. In addition, the effect of a serious attack is very injurious to the tree.

This insect is controlled to a large extent by two hymenopterous parasites.

A number of moth and butterfly larvae also feed upon the coco-nut leaves, but these are pests of a rather local nature. Two of these, *Brachartona catoxantha* and *Hidari irawa*, occur in other parts of the East; while two others, *Padraona chrysozona*, and *Thosea cinereomarginata* occur in the Philippines.

Brassolis isthmia, which occurs in Panama, and *B. sophorae* in British Guiana, are two other leaf-eating insects included in the list.

Omiodes blackburni, which is known as the palm leaf roller in Hawaii, is also mentioned.

Locusts are recorded as occasional serious pests in Madagascar, and the author states that in Mindanao he has seen coco-nuts thoroughly stripped by these insects, and so badly injured that the fruiting would be delayed two years.

Another Orthopteron, *Graeffea cocophaga*, one of the walking sticks, or stick insects, has at times been a pest in certain places.

Its distribution extends from New South Wales northward and eastward across Polynesia. It feeds on coco-nuts, and has temporarily done considerable damage in places. It is large in size—about 20 centimetres ($8\frac{1}{2}$ inches) in length—but is inconspicuous on account of its colour.

Of all the scale insects, some thirty species, recorded as attacking the coco-nut, *Aspidiotus destructor* is stated to be the only one which is ever found in large numbers and charged with doing serious damage. *A. destructor* is probably found in every land where the coco-nut is grown. It is said to have been most serious in the Caroline Islands, where the coco-nut is the staple crop, but its occurrence is universal in coco-nut-growing districts, and while often kept in check by its natural enemies, it may at any time become sufficiently abundant to be a serious pest. The lady-birds of the genus Chilocorus appear to be the most efficient of its natural enemies. Trees that are growing under suitable conditions are less likely to be seriously attacked by this pest. To guard against injury by it trees should be amply spaced, provided with plenty of water in the ground, and, if necessary, cultivated and manured. It is stated that in Trinidad *Aspidiotus destructor* is often protected by an ant (*Aztecta charifex*), in such a way that the scale is completely guarded against its natural enemies.

The miscellaneous pests of coco-nuts include such forms as the robber crab (*Birgus latro*), parrots and crows, bats, rats, bandicoots, porcupines, hogs, and bears. The hog is said to be the worst pest of all these, destroying seed nuts which have been planted out, and young trees. In the Malay States, bears, pigs, and rats are said to do more damage to coco-nuts than the beetles. In Lower Perak, bears recently destroyed more than 1,000 coco-nut trees in one year.

PREPOTENCE IN PLANT BREEDING.

In the *Journal of Heredity* for January 1915, there appears an article under the title given above, by Mr. John Belling, B.Sc., sometime Science Master at the Grammar School in St. Kitts, and for several years past on the staff of the Florida Agricultural Experiment Station.

The article is reproduced herewith, as being of interest to West Indian agriculturists.

The work of breeding new flowers, fruits and vegetables from natural or artificial crosses, has been, and I believe can still be, carried out excellently with a minimum of Mendelian theory. The most important idea, I think, is that of *prepotence*, or transmitting power, or strength of heredity, as it is sometimes called. This rather loose term, so far as I have seen, has been used to embrace at least the following different Mendelian cases:—

(1) The dominance of a character in a first-generation hybrid. (The dominant parent is prepotent for the character.)

(2) The presence in the prepotent parent of a number of separate dominant characters, or of a number of characters inherited as a dominant unit. (An important case of prepotence.)

(3) The excess of dominants, from the cross of a positive homozygote with a recessive, over those from the cross of a heterozygote with the recessive. (The pure-bred is more prepotent than the mongrel.)

(4) The presence of the dominant character in *all* the progeny of the back cross of a hybrid with its dominant (prepotent) parent, whereas only a fraction shows the recessive character when the hybrid is crossed with the recessive parent.

(5) In cases of imperfect dominance, the difference in *appearance*, as well as in transmitting power, between the homozygous dominant and the heterozygote. (Recognition of prepotence by external characters.)

(6) The large excess of dominants in the progeny of selfed hybrid plants. (Influence of the prepotent grandparent.)

(7) The constancy of a selfed homozygous dominant compared with a hybrid. (The former is prepotent.)

(8) The constancy of a selfed recessive compared with a hybrid. (The pure-bred has greater transmitting power.)

If, then, the breeder of improved plants uses pedigreed lines (centgener plots, or ear-row tests) instead of mixed cultures, and selects in each generation the plants which are most prepotent *for the particular characters* he needs, he can, I think, usually leave Mendelian formulae to those who are working to discover new facts.

THE INFLUENCE OF FOOD POOR IN LIME ON THE COMPOSITION OF GROWING BONES.

In the *Monthly Bulletin of Agricultural Intelligence*, October 1914, of the International Institute of Agriculture, there is a review of an article in the Berlin *Biochemische Zeitschrift*, July 29, 1913, by Stephan Weiser, on this subject, which gives some striking facts.

The writer kept a group of three young pigs, from January 15 to October 1, on food rich in lime, and another perfectly similar group, on rations poor in this substance. After the animals were slaughtered, the bones were analysed. It was found that the rations deficient in lime so affected the development of the animals that from the beginning their increase in weight was about 20 per cent. less than that of those fed on food rich in lime. The prolonged want of lime always caused diminished appetite, and consequently diminished live weight. The pigs that had not been fed with enough lime had, in general, deformed, pliable bones, thinner and easier to cut than those of the other lot; they also contained considerably more water, and much less ash.

GLEANINGS.

At the Royal Horticultural Society's Show, held at their hall on December 15, 1914, a plant that attracted a good deal of attention, especially among experts, was a splendid pink *Poinsettia rosea*, a new plant which has been obtained by crossing the red with the white variety. It was shown by Messrs. H. B. May of Edmonton. (*The Times*, December 16, 1914.)

Mr. A. S. Archer of St. John, Antigua, has communicated with the Imperial Commissioner of Agriculture, expressing his desire to obtain 5,000 fertile nuts of *Pandanus utilis*. Anyone who can supply the whole amount, or any part of it, should write to Mr. Archer, who will be glad to state the price he would be willing to pay per 1,000, and also give instructions as to mode of shipment.

The cotton boll worm is unhappily creating serious damage to this year's cotton crop in Cyprus, in some cases causing a loss of 50 per cent. in yield. It has been no doubt present here and there in Cyprus for some time, but as no reports were made to the officers of the agricultural department, no remedial measures have been applied, and thus the trouble has gradually spread. (The *Cyprus Journal*, October 1914.)

The eleventh and twelth annual report of the West of Scotland Agricultural College has been received at the Office of the Imperial Department of Agriculture. It contains interesting bulletins (1) on the conduct of school gardens, (2) on manures, their composition, etc., (3) on the results of some experiments with farmyard manure, (4) on poultry keeping. Allowing for differences in climatic conditions, etc., these provide suggestive reading for West Indian agriculturists.

At Magaliesberg, South Africa, some wonderful returns have been obtained from orange trees. It is recorded by a grower, in *South African Gardening and Agriculture*, August 1914, that from three orange trees, estimated to be over fifty years old, he has taken 11,030 fruits this season, some of which were $3\frac{1}{2}$ inches in diameter, and he expects to get another 2,000 or 3,000 yet.

It would appear from Circular No. 47, issued by the Bureau of Standards at Washington, that for all practical, and most scientific purposes, the United States yard and pound are the same as those in the United Kingdom. The United States gallon, used for the measurement of liquids only, is however, only $\frac{5}{6}$ of the Imperial gallon, while the United States bushel, used in the measurement of dry goods, is approximately $\frac{32}{33}$ of the Imperial bushel. (*Nature*, December 17, 1914.)

The following from *Nature* for December 17, 1914, affords an example of the success attending a highly perfected system of agriculture. Although the total production of rice in Spain is the lowest of the six rice-growing countries, the yield per acre is double that obtained in Italy and Egypt, and more than six times the official figures for India. This result is due to the thorough cultivation of the fields, to the system of transplantation, and to the use of large quantities of nitrogenous and phosphatic manures.

From the results of a series of experiments made at the Tucumàn agricultural experimental station in Argentina, to compare the relative merits of the planting of thick and thin sugar-cane, it would appear that provided the sort planted is healthy, the thickness of the cane used is of little importance. A rigorous selection from the point of view of healthy condition and freedom from disease, is much more valuable than a selection regulated merely by the size of the cane. (The *International Sugar Journal*, December 1914.)

The idea of sending a United States trade exposition ship to South America, in order to develop the markets there for exporters, has taken practical shape. The International Mercantile Company's Steamer 'Finland' has been chartered for the purpose, and will sail from New York on January 28. Her itinerary includes the principal ports of the West Indies, and of Central America as well. She will carry about 400 representative manufacturers and salesmen, whose exhibits will be adequately displayed on board. (*Yorkshire Post*, December 22, 1914.)

In his recent lecture on the Trinidad oilfields, at the House of the Royal Society of Arts, London, Professor John Cadman stated, with regard to their prospects, that: 'whilst the rate of development has not been as rapid as one might have expected, and in some respects there may be room for criticism, to which the writer is not prepared to subscribe, much good work has been accomplished, many difficulties have been overcome, many new problems have been solved, and sufficient work has been accomplished to demonstrate unquestionably the potential value of Trinidad as a source of petroleum.' (*Oil News*, December 19, 1914.)

The use of fish as cattle food has a novel sound, but it appears to be a common practice in various parts of the world. In Shetland and Iceland dry salt fish is fed to cattle, sheep, and even to horses. So long ago as 1853, Sir John Lawes carried out experiments at Rothamsted on the feeding of pigs with dry Newfoundland cod fish. He found that the fish-fed pigs were fat and well grown, and there was a very good proportionate increase to food consumed. Although fish does not compare favourably with ground nuts, so far as fattening value is concerned, it is suggested that on the coast a considerable saving might be effected by its use. (*Nature*, December 17, 1914.)

Maize is cultivated in Mauritius almost entirely by small planters, who find a ready local sale for their produce. The methods of cultivation leave much to be desired, and no attention whatever is given to the selection of seed for planting purposes. It has been demonstrated repeatedly that with careful selection of seed for sowing, considerably increased yields may be obtained. The work of selection is of the simplest, and can be readily carried out by the planters themselves. By attention to this selection, increased crop yields of 10 to 20 per cent. may readily be obtained. (*Bulletin No. 3, General Series, 1914*, Department of Agriculture, Mauritius.)

STUDENTS' CORNER.

The beginning of another year of reading for students who have in view the obtaining of the certificates of the Imperial Department, seems to be a good opportunity for impressing again on them the necessity of careful and continual observation. The trained eye sees very much more in an object of interest than the casual glance of one not interested. Or in other words, the eye sees in each object just what it has the capacity of seeing. And observation, that is careful attention to what one is looking at, enlarges this capacity. This is true of every department of human industry, but perhaps most so with regard to agriculture. For the planter has not to deal with an exact science. The very best agricultural systems, the most scientific methods of planting, may fail from causes over which system or science has no absolute control, such as weather conditions. Hence the necessity of careful observation, so as to apply system and science intelligently to meet the varying conditions which arise from non-preventible causes. Many things pertaining to agriculture are hard to understand, but there are many others, which ought to be no mystery to the observant man, because they are only the natural effects of causes which he has taken note of. For instance, if a field, which has been yielding a good return of the crop grown on it for several seasons, begins to show a marked diminution in its yield, the observant planter would know the particular reason, out of the many that there might be—want of drainage, lack of proper manure, bad tilth, etc.

The observant planter must first and foremost note and study the conditions of his own particular locality. These West Indian islands are in some ways very much alike, yet it is well known that the conditions of soil and rainfall vary so much, even in islands that are within a few miles of each other, that rules and methods, not to speak of crops, have to be modified to suit local conditions. For this reason the Imperial Department of Agriculture suggests varied subjects for special study of each student, in order to stimulate observation of, and attention to, a subject that can be investigated locally. For instance, a student in Antigua could hardly have the possibility of making personal observations on the growth and manufacture of cacao, or a student in Dominica of becoming practically acquainted with the cultivation of cotton. Even if they obtained in either case a knowledge from books, the opportunities of cultivating their powers of observation would have been lacking.

But not only is this true of different islands, but it is so of different districts even in quite small islands. In fact the necessity of local observation of their capacities and needs extends to different estates in the same district, and even further, to different fields on the same estate. Observation on these lines is within the power of any agricultural student. He may observe—to take an example from sugar-cane planting—how each variety grown on the estate he has to do with, conducts itself in different fields. Perhaps it does well on one, and only fairly well on onother. Then his observation will probably find out the reason for this, and he may be able to make improvements in the future.

In conclusion, the careful training of the faculty of observation will also safeguard the agricultural student against the danger of blindly following a beaten track in his occupation. Nor, on the other hand, will he be persuaded blindly to undertake every new proposition, because his powers of observation will have trained him to weigh and estimate the probabilities before entering on action.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. On account of excessive rain the cotton crop in this island is not turning out as well as was expected. The Agricultural Superintendent has been discussing with the owners of some estates a scheme for buying cane from small holders, and has been holding meetings in various parts of the island in connexion with the agricultural situation as affected by the war.

DOMINICA. An early flowering of the lime trees seems pretty general. The fruit should be ready for the early fresh lime market in New York. There has been considerable planting of lime trees at the end of the year, 9,650 plants having been distributed from the Botanic Station in the month of December.

MONTSERRAT. The Agricultural Superintendent reports that the general experience in the island this year has been that the crop of yams is a comparative failure. The reason of this is unknown. The experimental plot of 1 acre of bay trees yielded 3,256 lb. of green leaves from which 37 lb. of oil has been extracted. The cultivation of maize has been considerably extended, and the question of making 'farine' is receiving attention. The small shipment of ground nuts sent to Canada sold for 5c. per lb., and was said to be worth probably 7c. per lb. in bulk. There seems to be a possibility of trade in this product. A meeting of persons interested in cotton cultivation was addressed on December 30 by Mr. J. L. Fonda, the cotton expert now visiting the West Indies.

ANTIGUA. The sugar-cane crop of the island has much improved during the last three months, and in some parts the cotton crop looks promising. The area under cotton is about 742 acres. The total rainfall for 1914, as recorded at the Botanic Station, was 37·16 inches.

ST. KITTS. In December the cane crop made good progress and the prospects are more favourable. The Central Factory was to begin operations on January 18 so as to fulfil their contract for sugar sold in advance by March 31. The next crop is being rapidly planted, and the germination is good. There will be a slight increase in acreage of cane planted. The one estate that planted cotton as a permanent crop is now planting cane as well. Mr. Fonda visited the island and addressed meetings of those interested in the cotton industry. He was much pleased in general with the condition of cotton both in St. Kitts and in Nevis. The rainfall for the year at the Botanic Station was 50·87 inches.

NEVIS. The cotton crop throughout the island has been reaped, and, on the whole, the returns are fairly good. The small holders are putting some of their lands into cane, and are making efforts towards better cultivation and more adequate manuring. The provision crops are doing well, and there is an expectation of a very large return of sweet potatoes. In this island also, Mr. Fonda addressed a meeting of cotton growers on December 16, when many interesting points were noticed. The rainfall for the year was 53·55 inches.

VIRGIN ISLANDS. The cotton fields have been much improved in condition owing to the recent rains. Unfortunately however, the heavy downfall has caused the cotton plants in some places to suffer from arrested development of the bolls. There is considerable extension in the cultivation of food crops throughout the islands; sweet potatoes and cassava have received the most attention, and maize is being largely planted also. The interest in the lime and coco-nut industries is being maintained.

FUNGUS NOTES.

TWO BEAN DISEASES.

Two well-known diseases to which beans of the genus Phaseolus are subject are described in Special Bulletin 68, of the Michigan Agricultural College Experiment Station, by J. H. Muncie. Descriptions of their field characters are given in considerable detail, and form the basis of the summary presented below. Little appears to be known as to the occurrence of bean diseases in the West Indies, the crop usually being a very subsidiary one, and receiving little attention. In consequence of the regular importation of seed from the United States, the probability of the occurrence here of both the diseases in question is very considerable, and the following information may enable them to be recognized. Bacterial leaf diseases of beans similar to, or identical with, 'blight' are not uncommon in Barbados.

Bean anthracnose, due to *Colletotrichum cindemuthianum*, is a disease which begins from infected seed, appears on the young seedlings, and ultimately infests the leaves, stems, and pods of the developed plants. The fungus penetrates the pods to the seeds within, upon which spots are developed which necessitate the sorting by hand of the crop, and form a starting point for a new cycle of disease. The spots appear on the seeds as sunken black or brown specks in the case of light attack, or as brownish or blackened spots, usually in the form of a ring with a dark or rifted centre, where the attack is severe. On the seed-leaves, circular or kidney-shaped blotches appear, which may enlarge until the whole leaf is involved. Elongated cankers are produced on the stems, and many young plants are lost from the direct or indirect consequences of stem and root infection. Young leaves may be crinkled owing to the effect of the fungus on the margins; older leaves are affected mostly on the veins, and the portion of the leaf blade beyond the attacked vein turns yellow and dies, for want of water. On the pods the lesions start as small reddish pin-point spots, which enlarge into circular or kidney-shaped sunken areas with a raised rim. Yellow or pink spore-masses are produced in the centres of these spots. Severe infestation occurs as a consequence of continued wet weather, and a general yellow appearance, due to the dying of the leaves, is then recognizable in the fields.

Spraying with Bordeaux mixture is a measure of doubtful efficacy, nor is any other cure known. According to M. F. Barrus (***Phytopathology***, I, 190), varieties which have been found resistant to certain strains of the fungus are attacked by other strains, and no completely resistant variety has yet been produced. Freedom from the disease can however be secured by taking precautions against planting infected seed. Pods must be selected which have no spots whatever upon them. It is not sufficient to select unspotted seed, since a slight infection may not be noticeable. An infection so slight as this upon a pod would have little significance, since the fungus would not have penetrated to the seeds within. It is advisable, however, in order to prevent infection from such a source, or from merely adherent spores, to dip the pods for ten minutes in corrosive sublimate solution (1 part to 1,000 of water). The seed so obtained should be used to plant a seed plot on clean ground. Cases arising after this treatment should at the worst be few, and capable of elimination by hand-pulling.

The second disease, bean blight, is caused by *Bacterium phaseoli*. The signs of its attack on the seed are, in light cases, yellow spots or blotches, not definitely circular, frequently on the side of the seed which was attached to the pod; in severe cases, yellowing and shrivelling of the whole seed. On the seed-leaves small amber-coloured spots appear, with which may be associated a light yellow slime. On the foliage leaves the disease produces irregular water-soaked areas, which are usually bordered by distinct yellow or red lines. These areas gradually enlarge until the entire margin, or half the leaflet, may be involved. The watery areas later become brown and dry. On the pods, watery pustules are first formed, which develop into amber-coloured irregular blotches with uneven green centres; clumps of the bacteria ooze out, and dry into yellow crusts on both leaves and pods. The general appearance of a field, when the prevalence of humid weather conditions has led to a severe infestation, is described as suggesting that the plants had been drenched with hot grease. At a later stage the older leaves look dry and burnt, and excessive new growth occurs in the attempt to provide new foliage. Fruiting is seriously interfered with, and the pods cease to fill out.

No fully effective means of control is known. The germs are able to resist drying for a long period, and become widely spread, so that probably reinfection does not entirely depend on seed. The measures recommended for anthracnose should, however, also reduce considerably the incidence of blight.

CITRUS CANKER.

In the last number of this Journal (p. 14) information was given concerning citrus canker. This may now be extended by the abstracts, appearing in *Phytopathology* for December, of two papers to be read at the Annual Meeting of the American Phytopathological Society.

CITRUS CANKER. A. B. Massey. A serious disease, citrus canker, appeared in south Alabama and localities of Florida about two years ago, but came to our attention in January 1914.

By isolation cultures, artificial inoculations, and reisolations the cause has been proved to be due to a species of Phoma.

It has been found on a number of different species of citrus, but its greatest damage is confined to the grape fruit, and hardy orange (*Citrus trifoliata*) stock. It attacks seriously the fruit, twigs, and leaves of the grape fruit, causing the leaves to drop, and injuring the marketable quality of the fruit. In the hardy orange no case of fruit infection has been found, but the twigs and leaves are heavily attacked, causing defoliation and serious injury to the young twigs.

THE CITRUS CANKER SITUATION. R. Kent Beattie. A new oriental disease, far exceeding the chestnut bark disease in infectiousness, has recently made its advent in the Gulf States. The citrus canker occurs on all species of citrus, but is especially severe on grape fruit. It develops upon the leaves, stems, and fruit. It may kill young trees, but does not develop girdling cankers on older stock. Its chief injury is to the fruit. The Satsuma orange is highly resistant.

The disease was brought from Japan on Satsuma, or *Citrus trifoliata* stock, and has been nursery-distributed throughout the Gulf States. Quarantine measures, and the destruction of infected trees and nursery stock by burning are being used to combat it.

This disease offers a splendid illustration of the danger to which we are constantly exposed from plant diseases existing unrecognized in far-off corners of the earth.

TURF.

Probably the best material which can be used in the West Indies for the successful making of a lawn, is the well-known 'devil's grass' (*Cynodon dactylon*), yet all owners of lawns are troubled from time to time by at least two nuisances, the growth of weeds or coarser grasses among the lawn grass, and the tendency of the latter to get 'patchy', that is to say, to die down in spots.

In the *Agricultural Journal of India*, October 1914, Mr. C. M. Hutchinson, Imperial Agricultural Bacteriologist, has an instructive article on the culture as turf, of *Cynodon dactylon*—known in India as doob—which has many points of interest to anyone in these islands who wants to make the best of a lawn. The writer shows that the judicious use of ammonium sulphate is eminently successful both for maintaining the condition of a lawn of devil's grass, and for ridding it of deeper rooted weeds and grasses.

Devil's grass is a shallow-rooted plant, and obtains its food from the surface layer of the soil, whereas the obnoxious weeds and coarser grasses are comparatively deeper rooted. To supply plant food which tends to remain near the surface, or to undergo only near the surface such changes as are necessary to make it assimilable by plant roots, obviously results in the increased growth of the shallow-rooted plants, and the diminished power of growth of the deeper-rooted kinds. Nitrogen is the chief requirement of devil's grass, as experiments have shown. Ammonium sulphate, as a source of nitrogen, is retained by the soil to which it is applied, and tends to remain near the surface, whereas nitrate of soda is easily washed down through it. This, then, is the reason for the use of ammonium sulphate for encouraging the growth of devil's grass at the expense of other deeper-rooted coarser grasses and weeds. Experiments at Pusa showed that the application of ammonium sulphate to a very bad piece of turf, containing in addition to devil's grass several species of coarse grasses and Euphorbiaceous weeds, resulted in the practical elimination of everything except the devil's grass.

A plot of specially bad turf was treated with ammonium sulphate at the rate of $3\frac{1}{2}$ lb. dissolved in 4 gallons of water per 100 square feet. This was applied with a watering pot. Thus for a tennis court of 78×36 feet, 98 lb. of ammonium sulphate would be required. In forty-eight hours after the application the coarser grasses and weeds appeared to be dead, as did also the devil's grass, being brown and burnt; but two days later fresh green shoots of devil's grass were seen, which gradually spread over the plot, and in one month's time, with no further treatment but daily watering and occasional cutting, the whole surface was covered almost exclusively with devil's grass.

It will be seen that this rate of application of ammonium sulphate, being very high as compared with agricultural practice, is certainly expensive, but in dealing with such small areas as tennis courts, putting greens, cricket pitches, or small ornamental lawns, this expense would probably be more than justified by the result. And it must be emphasized that unless ammonium sulphate is employed in this liberal manner, the elimination of weeds aimed at will not be obtained. It does not seem likely that an application of ammonium sulphate would be necessary more than twice a year, and that at only half the quantity, i.e., $1\frac{3}{4}$ lb. in 4 gallons to 100 square feet, roughly speaking 50 lb. for an ordinary tennis court. The necessity for such application can be judged by the colour of the grass; if this becomes pale green or yellowish, an application of this smaller quantity will soon restore it to its proper colour. In cases where an unduly vigorous growth of weeds occurs, the application of the ammonium sulphate in a solid form at the first-mentioned rate, has had even a more marked effect in the destruction of the weeds. It should be sown over the ground as evenly as possible, and then watered in with the same amount of water as if dissolved. This result may perhaps be obtained just as well, and more simply, by dissolving the amount of ammonium sulphate in 3 gallons of water instead of 4 gallons. In dry weather, lawns should be watered daily; but too much water will counteract the effect of the salt, by washing down the available plant food from the surface layer where it is needed by the devil's grass. The actual amount daily needed is small—just sufficient to moisten the top inch or two of the soil.

The use of sand as a dressing for a lawn is recommended. At Pusa, it is stated, the application of an inch of river sand to a piece of poor turf resulted in a great improvement, not only in the growth of the grass, but in the elimination of bad weeds from the turf.

With regard to cutting the grass on a lawn, the following remarks by the writer quoted are worth noting. If the cut grass is not caught in the box on the mowing machine, and removed, it remains on the surface, either to dry up and resist decay for some time, or to attract insects which may injure the growing turf. The manurial effect, sometimes attributed to the untidy habit of leaving the cut grass on the lawn, does not seem to be real. But if the cut grass is removed, and soaked in water for about a week, the extract thus prepared does contain a considerable proportion of ammonia, and if watered on to the lawn, has a similar effect to the application of ammonium sulphate, although not so lasting. Unfortunately the grass water thus prepared has a most objectionable odour, which, however, disappears after a short time. Cutting should be carried out systematically. Too long intervals between cuttings ruin turf, because they allow the formation of stems which are not only long, but thick. Cutting in fact may be regarded as a form of pruning the grass plant, which stimulates its growth while altering its shape, causing it to produce a larger number of leaves and stems on the same area, and therefore a thicker and closer turf.

With regard to rolling, it is fatal to turf, if carried out when the surface is too wet. This is also true of cutting. It is obvious that the weight of the roller or mower will puddle the wet surface of the soil, causing the formation of a hard crust.

The treatment of turf with ammonium sulphate, outlined above, should be adopted preferably at a period when heavy rain is not to be expected, which would probably wash the salt too quickly from the top layer of soil. In Pusa the stimulating effect of the treatment in dry weather was much more marked than during the rains.

In conclusion, it may be said that experiments in turf formation on the foregoing lines may be made by anyone possessing a few square yards, a fair supply of water, and sufficient interest in the subject.

The manurial value of road sweepings is naturally very variable. In sweepings collected from country roads there may be a large proportion of sand and other material of no direct manurial value. The smaller proportion of urine in road sweepings makes them less valuable than stable manure, as the nitrogen is not so readily available. An analysis of a sample of road scrapings, carried out by the consulting chemists to the Royal Agricultural Society in England, leads to the conclusion that the scrapings are little, if at all, richer than ordinary soils, as far as manurial value is concerned. (The *Journal of the Board of Agriculture*, November, 1914.)

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR

December 15, 1914.

ARROWROOT—1¾*d.* to 4¾*d.*
BALATA—Sheet, 2/2; block, 1/10 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 72/- to 76/- per cwt.; Grenada, 69/ to 72/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £26 per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 14*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 2/3 to 2/9; concentrated, £28; Otto of limes (hand-pressed), 8/-
LOGWOOD—No quotations.
MACE—9*d.* to 2/3-.
NUTMEGS—4½*d.* to 5¾*d.*
PIMENTO—Quiet.
RUBBER—Para, fine hard, 2/9½; fine soft, 2/6½; Castilloa, 1/9 to 1/10.
RUM—Jamaica, no quotations.

New York.—Messrs. GILLESPIE BROS., & Co., July 24, 1914.

CACAO—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c.
COCO-NUTS—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
COFFEE—Jamaica, 9¾c. to 13½c. per lb.
GINGER—7½c. to 10c. per lb.
GOAT SKINS—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $2·50.
LIMES.—$3·75 to $4·50.
MACE—45c. to 53c. per lb.
NUTMEGS—110's, 11¾c.
ORANGES—Jamaica, $2·00 to $2·50.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., January 4, 1915.

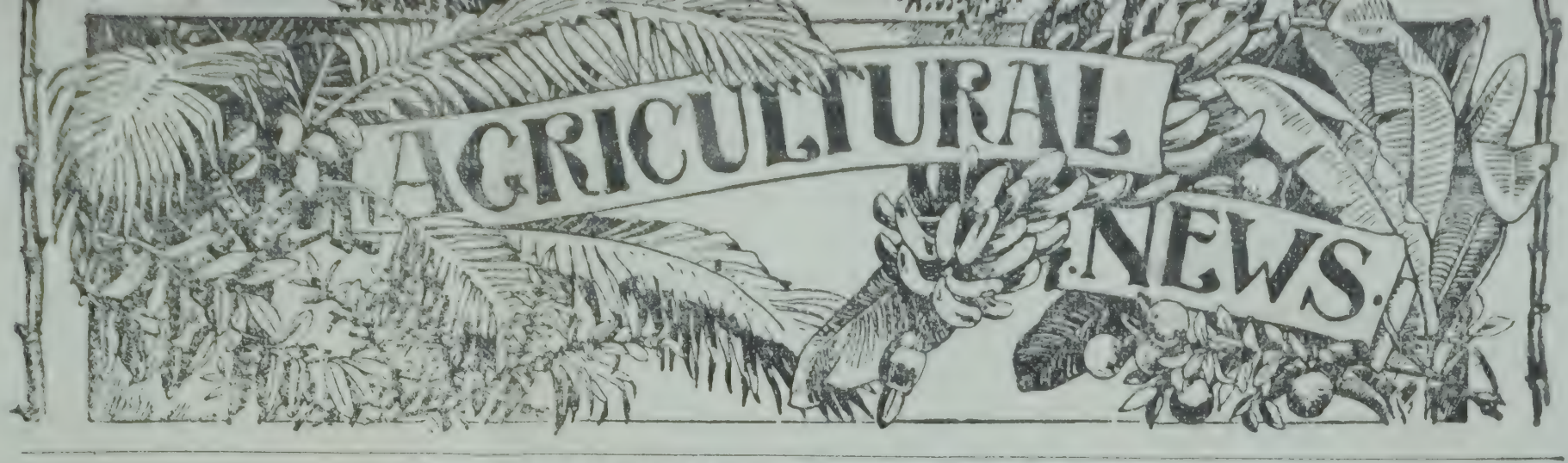
CACAO—Venezuelan, $13·50 to $14·00; Trinidad, $13·50 to $1400·.
COCO-NUT OIL—80c. per Imperial gallon.
COFFEE—Venezuelan, 11c. per lb.
COPRA—$4·00 per 100 lb.
DHAL—No quotations.
ONIONS—$2·80 per 100 lb.
PEAS, SPLIT—$8·50 per bag.
POTATOES—English $2·75 per 100 lb.
RICE—Yellow, $6·00; White $5·25 to $5·30 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., December 31, 1914, Messrs. T. S. GARRAWAY & Co., January 25, 1914.

ARROWROOT—$4·00 to $4·50 per 100 lb.
CACAO—$12·00 to $13·00 per 100 lb.
COCO-NUTS—$16·80.
HAY—$1·75 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $48·00 to $50·00; Sulphate of ammonia $78·00 to $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$8·00 per 190 lb.
PEAS, SPLIT—No quotations; Canada, no quotations.
POTATOES—Nova Scotia, $2·00 per 160 lb.
RICE—Ballam, $6·00 to $6·20 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·00 per 100 lb.

British Guiana. Messrs. WIETING & RICHTER, January 9, 1915; Messrs. SANDBACH, PARKER & Co., January 2, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	12c. to 14c. per lb.	12c. per lb.
CASSAVA—	$1·08	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$16 to $20 per M.	$23 per M.
COFFEE—Creole	—	16c. per lb.
Jamaica and Rio	14c. per lb.	16c. per lb.
Liberian	10c. per lb.	11c. per lb.
DHAL—	$5·25 to $5·75	$5·50 to $5·60 per bag of 168 lb.
Green Dhal	——	——
EDDOES—	$2·16	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	——
PEAS—Split	——	$9·75 per bag. (210 lb.)
Marseilles	——	—
PLANTAINS—	16c. to 48c.	——
POTATOES—Nova Scotia	$2·25 to $2·40	$2·50 to $2·75
Lisbon	——	——
POTATOES—Sweet, B'bados	$2·16	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
TANNIAS—	$2·40	——
YAMS—White	——	——
Buck	$2·16	——
SUGAR—Dark crystals	$3·30 to $3·40	$3·50
Yellow	$4·00 to $4·10	$4·00
White	$5·00 to $5·25	——
Molasses	——	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	—



A FORTNIGHTLY REVIEW
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The Sugar Situation.

AS we go to press, the New York quotations for raw sugars show a decided upward tendency, fulfilling the general anticipation that, if the usual quantities are this year to go to Canada, growers will be able to dispose of their crops on the basis of something over $5 per 100 lb., New York Prices by the end of April or the beginning of May.

The sugar situation since August 1, of last year, has been very complicated and extremely difficult to prognosticate. Immediately after the outbreak of war, the buying stimulation which permeated the United States as a result of purchases made by the British Government in that country, created a fictitious value of over $6. Supplies were not curtailed, and when everyone was full of sugar, the demand suddenly ceased, and it began to be realized that supplies, instead of proving short, were much in excess of the demand. Towards the end of September therefore, a rapid decline set in, and up to the present date a level of about $3 has been steadily maintained. But now that stocks are becoming exhausted, and the Cuban crop is being held up by rain, a revival has set in which we hope may be lasting, at any rate, as far as the West Indies are concerned.

The world's sugar market is almost entirely governed by England, and it will be worth while considering briefly the action which that country has taken since last August. The Royal Commission, which was at that time appointed to deal with the situation resulting from a cessation of Austro-German supplies, purchased large quantities of raw sugar from Cuba, Java, and the British Colonies. The next action was to fix a maximum price for ordinary refined sugar. This did not seriously interfere with the grocery trade, but it affected manufacturers who were accustomed for many years to a supply of very cheap raw sugar. Quite recently, a reduction has been made in the case of Mauritius sugar for the benefit of the confectioners.

Going back to the events of October, the Government further found it necessary to prohibit the import of all sugars by private persons, since some of these supplies had undoubtedly been coming from neutral countries, which were replacing this sugar with consignments received from the enemy. As a result of representations made by the West India Committee, the Government agreed to permit the importation of

West Indian grocery sugars by special license, since the origin and destination of this class were unquestionable.

At the time of writing, the attitude of the British Government as regards the immediate and distant future is not known definitely. The stock of sugar and visible supplies in England are sufficient to last until about May. When recently in England, the writer had the advantage of personal introductions from the Manager for the Royal Commission to the leading sugar firms in Mincing Lane, and the outlook for the future seemed to be quite indefinite. The supply of sugar from the West Indies (apart from Demerara) being quite inappreciable, its importance from the English aspect is also slight, but as far as one could judge, the opinion was that the Canadian market would not be deprived of its usual supplies.

The critical time in England will be June, July, and August. After August, the Java supplies begin to come in, and on these the Government will largely depend until the end of the year. But for the June to August period, the sources of supply seem somewhat uncertain. Cuba will no doubt be drawn upon. Then, it should be remembered as well, that since the war, almost unheard of countries as regards sugar exports have come to the front; for example, the Argentine, Columbia and Peru. It is true that individually, the output from these places may be comparatively small, but in combination they have helped and will help to swell the supply of cane sugar considerably.

Taking everything into consideration, it is fairly certain that a level above the normal will hold for the greater part of the current year, in both New York and London; but the question of increased freights has to be considered. These are influenced by fluctuations in the naval situation.

Looking further ahead, we may perhaps presume to put forward views on the probable situation in three years' time. So much depends on the progress of military operations that little can be said which is dependable. Every question is met by another—How long will the war last? It is essential to remember that any formal conclusion of hostilities will not end the present economic disturbances. As an example, assume that for this year and next the German beet sowings show a reduction of 20 per cent. and 40 per cent., respectively, and that peace is established in 1916. It will be obvious that there will be a serious reduction in 1917 also, and that it will take many years for the industry to recover itself. This circumstance may assist in arousing a stronger feeling in favour of a preference for colonial cane. It will at any rate tend to stimulate the growing of that crop, for a shortage of beet must mean enhanced prices.

There can be no doubt that when Continental sugar becomes available again in large quantities, the British manufacturers will turn to these supplies if they possibly can. Indeed, it is scarcely to be expected that the Government will ever consider a complete departure from the Continental trade. They will however take care to ensure a larger supply of cane sugar from the Colonies in the future than they have done in the past.

As regards an English beet industry, this subject exists at present in a state of controversy. Like colonial cane growing, beet cultivation needs fostering by the Government, but little action is likely to be taken until some practical estimate is put forward to show the limits of the proposed area under cultivation. With English beet, as with colonial cane, the intending growers should take the initiative and prepare some definite statement as to what they are ready to produce. It seems futile to say that sugar-cane can be grown in East and West Africa. But it would not be futile if the respective Departments of Agriculture took the matter up as a definite problem, and prepared a local statement showing immediate possibilities. These reports could then be considered by the Imperial Government as a basis for decision in the matter of providing preferential tariffs.

SUGAR INDUSTRY.

COLONIAL CANE, OR HOME-GROWN BEET?

In *The Nineteenth Century and After*, for December 1914, Mr. Scard replies to Mr. J. W. Robertson Scott's views on the proposed development of a British beet industry.

Mr. Robertson Scott quotes the farmer's profits at £3 per acre, but the present writer points out this would mean the production of 13 tons of beet per acre, containing 15 to 16 per cent. of sugar, which is even above the average for all continental countries.

The writer raises the question as to whether it would be wise to introduce beet into English systems of agriculture: 'This country needs all the corn and dairy products it can sow.'

Reference is made to the Cantley venture, which, it is believed, can not pay under normal conditions without considerable protection.

The cost of technical labour in England for one thing is higher than it is in Germany.

During the German 1908-9 crop, one factory gave the high price of 22*s.* 4*d.* per ton for beet, and paid interest on capital of 22 per cent. Had the roots been paid for on the Cantley basis of 25*s.* for roots of normal sweetness, the dividend would have been reduced to 3 per cent.

American and European evidence goes to show that for the establishment of a successful beet industry in Great Britain, there must be protection of at least the £2 10*s.* per ton enjoyed by German beet.

The writer suggests that assistance should be given rather to colonial cane, which can be produced at a much lower cost level than temperate beet.

Sugar-cane can be grown at 10*s.* per ton, and 9 tons can be taken as making a ton of 96° sugar. In England it costs, according to the writer, 20*s.* to grow a ton of beet, and 7 tons go to a ton of 88° sugar. This means that cost per ton is

Cane sugar	£4 10*s.*
Beet ,,	£7

But the factory expenses for cane are greater than those for beet, although the megass is used for fuel, stores, skilled labour, etc. is higher. Also the exhausted slices of beet form good cattle food.

Capital expenditure is much the same in both instances, so first cost production of cane sugar is low by reason of the lower cost of the raw material. As a set-off in the cost of cane sugar, there are freight and shipping expenses to be considered, equal to about £1 10*s* to £2 per ton, in time of peace. Colonial sugar could then compete with continental beet if it received preferential treatment equal to that which continental beet receives.

There is about 550,000 tons of cane sugar available for the requirements of Great Britian annually. This is produced in British Guiana, the British West Indies, Mauritius, and Fiji. The remaining million tons might be produced in Africa.

The carriage of this produce would be beneficial to shipping interests.

The home-grown beet sugar could compete with the colonial, which would be handicapped by shipping charges.

Consumers need not be afraid of the protective tariff necessary. Even if it were as high as £2 10*s.* per ton, the increase in the price as compared with that due to the present duty would only be one-fourth of a farthing per lb., or 5*d.* per annum per head of population.

Political reference is made to the fact that the Government on leaving the Brussels Convention pledged themselves not to give preference to colonial sugar. The Government reserved the right, however, of withdrawing the pledge after giving six months' notice.

The writer concludes by pointing out that the climatic and labour conditions in the Tropics can be relied upon much more than Mr. Robertson Scott supposes.

MESSCHAERT JUICE GROOVES.

In the *Agricultural News*, Vol. XIII, p. 337 (October 24, 1914), attention is drawn to the Messchaert Grooved Roller for sugar mills. It was there stated that the device described appeared to possess merit, and that detailed reports of the results of their employment were awaited with interest.

In the *Louisiana Planter* for December 26, 1914, p. 412, Mr. P. Messchaert gives an account of the results obtained in the use of rollers grooved as he recommends, and also details further experiments in attempts to extend the application of the system he advocates.

In the first instance the application of the grooves was recommended to apply to the feed rollers. As the result of employing rollers grooved as recommended, it is found that the juice flows away easily from a grooved roller, passing out by the back as well as the front of the feed roller: the amount of the fine trash that is pressed into the grooves is said to be small, and to be easily removed.

It is further stated that as the result of applying the grooves, the running of the engine driving the mills became much more even, that it was possible to grind some 10 per cent. more cane for the application of the same amount of steam power, and that the resulting megass was much more even in quality, presenting greatly diminished fluctuations both in the sugar and the water contents.

It is stated that grooving enables large quantities of maceration water to be used without difficulty.

The most marked improvements have been obtained, as might be expected, from the application of the system to those mills doing less perfect work; more perfect mills present less margin for improvement.

In order to increase the extraction (crushing) when grooves are introduced, all that is necessary is to close the rollers until the megass begins to refuse to feed freely: this is said to be the main point to observe to make the system a success. Tables are given, showing the changes in the dimensions of the feed-opening in the case of six sets of mills in Hawaii.

As the result of experience, the author now recommends 'to give the juice grooves *not more* than $2\frac{1}{2}$-inch pitch and $\frac{1}{4}$-inch width. It is safe,' he states, 'to make them $1\frac{1}{2}$ inches deep, in 34-inch and 36-inch rollers. In 30-inch rollers, 1 inch depth is sufficient, with the same width and pitch, as these mills have so much smaller capacity in proportion to the length of the roller. One inch depth is enough as the bagasse does not press more than $\frac{1}{4}$-inch or $\frac{3}{8}$-inch deep in the groove, and is released by its own elasticity after passing the point of pressure. A small amount stays in the grooves and is easily removed by the scrapers.'

Some experiments have been made in grooving the discharge rollers, and further improvements appear to result from this. In one instance the 'discharge roller of mill 4 was turned *smooth* and only juice grooves $\frac{1}{8}$-inch wide, $\frac{3}{4}$-inch deep, and 1 inch pitch put in. This fourth mill now did better work than ever and gave a better extraction, but it has been in operation too short a time to say how it will stand wear.'

The writer goes on to say that 'the top roller should always be kept *rough* as it has to pull the bagasse over the returner bar, and we keep the surface grooves of $\frac{3}{8}$-inch pitch on them.'

Appended to the paper are reports of six engineers and managers giving their experience in employing grooved rollers, and from these it is evident that considerable gains in efficiency have been experienced.

Considerable excitement obtains in Australian sugar circles in connexion with the price of sugar. This appears to have been raised in Queensland, but in New South Wales sellers are not given the same advantages in this respect. The matter is discussed in the *Australian Sugar Journal* for December 3, 1914.

FRUIT AND FRUIT TREES.

CACAO PROHIBITION: EFFECT ON PRICES.*

At the closing auctions of 1914, in London, prices for cacao were ruling high. The intention to resume sales on January 5 was frustrated by the inability of the docks and wharves to unload steamers, and it was consequently impossible to get samples up in time.

Writing under date of January 12, 1915, Messrs. Gillespie Bros. & Co. state:—

'For some weeks the chief strength of the market has lain in the demand for export to neutral European countries: but on the 7th inst. the Government prohibited the export to any country on the Continent excepting France, Russia, Spain, Portugal, and to some specified Mediterranean ports. Naturally the effect upon the market was very depressing, business being practically brought to standstill.

'Interest in the supplies offered at auction to-day (when 5,545 bags were catalogued) was also seriously affected, and fine Grenada opened at 10*s.* decline, two fine marks selling at 66*s.* As importers generally were disinclined to accept so great a reduction, almost the whole of the catalogues were retired. Subsequently some parcels of fine Grenada were sold at 68*s.*, and this may be considered to-day's value. Common West Indian may be called 5*s.* lower: we value ordinary Jamaica at 63*s.* per cwt; some plantation Trinidad sold at 70*s.*

'Accra has fluctuated considerably in Liverpool, fair-fermented dropping to 48*s.* (Dec.-Jan. shipment), but recovering afterwards to 52*s.*

'Superior Bahia is being pressed for sale in Liverpool at very low prices.'

BOARD OF TRADE FIGURES (RAW) FOR 12 MONTHS.

	Imports.	H.C. & Export.	Stock 31 Dec.
1914	42,211 tons	40,733	11,154
1913	34,983 ,,	33,938	9,875

CACAO BUDDING IN ESTATE PRACTICE.

It has been demonstrated at more than one Agricultural Experiment Station in the West Indies, and in other parts of the Tropics as well, that the actual operation of budding cacao can be carried out with every reasonable hope of success. The fact that budding as an art has been satisfactorily accomplished is of much interest, but it will be of no practical benefit to the planter until experiments have been made to find out whether it is more profitable in the long run to establish estates with budded cacao rather than with seedlings.

From an article by Mr. W. G. Freeman, B.Sc., which appears in the *Bulletin of the Department of Agriculture*, Trinidad and Tobago (November-December 1914), it is learnt that such experiments are now being undertaken in Trinidad. The writer points out first the data which must be available in order that the planter may decide what is the correct answer to the vital question—'Does it pay'? It is necessary to know the cost of preparing budded plants on a considerable scale, the season at which to bud, the habit of budded trees, the best planting distance for budded trees, their power of resistance, age at which they come into bearing, extent to which they retain the characteristics of the parent tree, and the yeild of budded trees compared with ordinary seedlings.

Before proceeding to describe the special experiments laid down, the writer puts forward a few facts in connexion with the operation of budding. For instance, it is stated that bud wood when covered up with earth, remains in perfectly good condition for work on the next day. It is pointed out, also, that it is an advantage to be able to bud in the nursery, where the plants remain, demanding only ordinary nursery treatment, until thoroughly established. This circumstance is compared with the difficult procedure entailed in grafting by approach on the plantation.

Coming to the essential part of the article, the plots which have been arranged for this experiment of comparison are as follows:—

ORDINARY SHADE.
A. One acre of cacao budded at stake.
B. One acre of cacao budded in nursery.
C. One acre of cacao seedlings.
D. One acre of cacao grafted.

NO PERMANENT SHADE.
E. One acre of cacao budded at stake.
F. One acre of cacao seedlings.

The planting distance throughout is 12 feet by 12 feet. In order to make the results a real test of the value of budded or grafted plants, as compared with seedlings, it is necessary that the buds and grafts should be taken from the same trees as those which supply the seeds. Accordingly, a large number (twenty-nine) of Forastero trees have been selected on account of their bearing capacity over a period of four years, and the character of their cacao. A corresponding set has been selected for the Calabacillo stocks.

The stock plants raised on plots A, B and E, will be budded or grafted next year from the same Forastero trees which supplied the seed for the seedling plots, and in the same proportion. It will be understood that seed from the whole of the selected trees is distributed uniformly through the plots. The results will, therefore, be thoroughly comparable, for seedling budded and grafted plants, all of exactly the same age, and all derived from exactly the same known trees, will ultimately be growing side by side under similar conditions.

It will be seen from this brief outline of the experiments, that the results in a few years, on account of the considerable scale of the work in hand, should provide valuable information for the benefit of cacao planters.

The increased employment of explosives in agriculture has necessitated the introduction of special legislation in New South Wales. It is stated in the *Agricultural Gazette* of that State (December 1914), that under the Act, any person is entitled to keep explosives, such as gelignite, cheddite, together with detonators, up to a total weight of 25 lb. For any quantity in excess of this amount, a magazine is necessary. The construction of such a magazine is described in the article under consideration.

*As we go to press, Messrs. Gillespie Bros. & Co.'s report dated January 27, 1915, comes to hand, in which it is stated that the tone of the market, in spite of the prohibition, has shown a gradual improvement, the prices for West Indian supplies showing a recovery of 1*s.* to 2*s.* per cwt. Reade rs will have noted that this improvement has been maintained from the cabled quotations during the past fortnight.

INDIAN CORN.

COMMERCIAL HANDLING OF MAIZE IN ANTIGUA.

A copy of an important proclamation, made by His Excellency the Governor, has just been forwarded by the Department of Agriculture from Antigua, which must be regarded as marking a decided advance in the attempts which have for many months now been made to develop the maize industry in the Leeward Islands and elsewhere. The necessity for giving consideration to increased production of Indian corn rests largely in the fact that the price of wheat, and indeed of most foodstuffs, has considerably advanced as a result of the war. It is very important that dependence on imported foodstuffs should be reduced as much as possible. This can be effected by the production of corn under the arrangements expounded in the proclamation under consideration.

For the past nine months experiments have been conducted in Antigua, which have proved conclusively that maize grown in that island can be thoroughly dried in a kiln; that corn so treated will keep in excellent condition for several months; and that Antigua kiln-dried corn is, in every way, as good as, if not better than the corn imported from America. It has also been proved that the production of corn meal of excellent quality presents no difficulties.

Under the circumstances stated above, the Government has decided to step in and give the movement official support.

The kiln-drying plant, which was erected in April last, is being extended and improved, and will shortly be in a position to cope with large quantities of grain. The Government granary will deal with corn in either one of the following ways: (1) the co-operative plan; (2) the purchase of corn for cash out-right; (3) the kiln-drying of corn

Under the co-operative plan, the Government granary will, on and after May 31 next, be ready to purchase any quantity, up to 10,000 bushels of maize of good quality, on the cob, at a fixed price of 2*s.* 6*d.* per bushel of shelled grain. Such a price is believed to cover approximately the average cost of production. The grain so bought will be shelled, kiln-dried, and stored. It will gradually be sold by auction, tender, or otherwise, according to local requirements, and to the best advantage. The profits on such transactions, after deducting all expenses, will be divided into four equal parts. One part will be credited to the granary, and the remaining three parts will be distributed in due proportion among the various growers who supplied the corn.

The second plan provides for the sale of corn outright to the granary. In such a case a price of 3*s.* 6*d.* per bushel of shelled corn, of good quality, will be paid up to June 30 next, and the granary will not bind itself to purchase more than a total quantity of 5,200 bushels. It will be understood that the sellers of such corn will have no claim to participate in any profits which the granary may make in dealing with the grain.

The third plan will meet the desires of growers who do not wish to dispose of their corn, and who only wish to have it dried. The charge for kiln-drying grain will not be more than 6*d.* a bushel, and the corn should be removed within three days of delivery. It is possible, however, that storage room for such grain will be available at the granary at a moderate charge.

In forwarding the copy from which the above information has been taken, the Superintendent of Agriculture adds that the necessary machinery for completing the equipment has been ordered from America, and will, it is anticipated, arrive in Antigua in about one month's time.

MAIZE CONSUMPTION IN DIFFERENT FORMS BY SWINE.

The increased attention which is being given in the West Indies to the cultivation of Indian corn, and to the raising of pigs, lends special interest to an article dealing with the digestibility of maize in different forms, appearing in the *Biochemical Bulletin* for April and July 1914.

The authors begin by pointing out that maize, as a fat and energy-producing cereal for meat production, has been the subject of numerous interesting and practical experiments, especially in connexion with swine. Digestion trials have been conducted with heavy-weight hogs, above twelve months old and 200 lb. in weight, and also with light-weight swine, approximately eighty days old and weighing about 70 lb. The comparative digestibility of maize fed in five forms, namely, whole grain on pod, shelled grain dry, shelled grain soaked, ground grain dried, ground grain soaked, has been carefully studied.

The results obtained indicate that light-weight swine digested whole grain on pod and shelled grain more thoroughly than did the heavy swine, while the latter utilized the soaked ground grain to better advantage than the former. The light-weight swine have the highest digestion coefficient for whole grain on pod, then dried shelled, dried ground, soaked shelled, and soaked ground grain, respectively; whereas with the heavy-weights, the soaked ground grain has the highest digestibility, then, successively, dried ground, dried shelled, ear, and soaked shelled corn.

A remarkable correlation between digestibility, and time required for digestion was found, it having been brought to notice by observations on the interval between the ingestion of bone black and its appearance in the fœces. More time was required for the food to pass through the alimentary canal of the light-weight swine in every case, except the soaked ground grain, than was required for this process by the heavy-weights. The former also digested all the preparations, excepting soaked ground grain, more thoroughly than did the latter. The same kind of correlation exists to some degree for each class of swine. Thus, with the younger swine, the ear corn was most digestible, then dried shelled, dried ground, soaked shelled, and soaked ground, in the order mentioned. The ear corn remained longest in the digestive tract, then dried ground, dried shelled, soaked shelled, and soaked ground grain, respectively. The older swine digested soaked ground maize the most advantageously, then dried shelled, dried ground, ear, and soaked shelled grain, successively. The soaked ground corn required the longest time for traversing the alimentary tract, then dried shelled, ear, dried ground, and soaked shelled, the latter two being equal in this respect.

Concluding, it may be stated that in a general way these feeding experiments have demonstrated that light hogs, weighing less than 200 lb., make the most rapid gains with whole corn on cob, in a natural state; while heavy-weight swine make the most rapid gains with the soaked shelled and soaked ground grains.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date January 23, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 80 bales of West Indian Sea Island cotton have been sold, chiefly Nevis 13*d.* to 13½*d.*, a few St. Kitts at 15*d.*, and Jamaica at 13*d.*

Prices remain steady, but owing to the war, spinners who mostly have stocks in hand, are not disposed to add to them until times are better.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended January 16, is as follows:—

There was a demand this week for the Fine, and Fine off in colour, for which Factors were willing to make some concession, but the remaining offerings of the odd bags in stock are still being held at our quotations. As the odd bags of the crop are thought to be nearly all marketed, and with only a moderate quantity of Fine, Fully Fine, and Extra Fine remaining in stock, Factors are in hopes they will be needed in time, enabling them to get their asking prices.

The crop lots continue to be held above the views of buyers.

We quote, viz:—

Extra Fine	23c. =	13½*d.*,	c.i.f. & 5 per cent.
Fully Fine	20c. to 21c. = 12*d.*	to 12½*d.*,	,, ,, ,, ,,
Fine	18c. = 11*d.*		,, ,, ,, ,,
Fine off in colour	16c. = 10*d.*		,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester, and Havre, up to January 16, 1915, were 50, 1,012, and nil bales, respectively.

VEGETABLE GROWING IN ANTIGUA.

The report on the Botanic Station and Experiment Plots, Antigua, 1913-4, was reviewed in a recent number of the *Agricultural News*, but in the space of that article it was not found possible to include a detailed account of any one series of experiments. In view of the importance of the local cultivation of foodstuffs at the present time, it has been thought desirable to reproduce from the report an account of the work done in regard to the growing of vegetables.

Mention has frequently been made in this journal of the important onion-growing industry that exists in Antigua, and attention has been called to an experiment made by the Curator, which showed that onion seeds, planted *in situ*, give a greater yield per acre than those transplanted according to local custom. The figures obtained from a ⅕-acre plot were, *in situ*, 396 lb. of onions; ordinary planting, 268 lb.

Onions planted *in situ* do not have such a good shape as onions that have been transplanted. It would be well for the local onion grower, however, to consider in future the advisability of sowing a small proportion, at least, of his seed in this manner. Part of the crop would then be ready for the very early markets. His main crop could be grown according to the recognized local custom.

The question of the keeping qualities of onion seed has been brought up from time to time by local growers, and another experiment made by the Curator showed that onion seeds can be kept with a fair amount of safety, in properly sealed receptacles, for about six months, after which the power of germination rapidly decreases.

The above results have been referred to already in the publications of this Department, but there is no harm in bringing such important practical points again before the public.

Useful trials have been made with varieties of tomatoes. The plants were pruned, so that each possessed one stalk only. A cheap medium on which to train them was found in old telephone wires nailed to posts, which were sunk in various parts of the beds. The seeds were sown towards the end of September 1913. The poorest yielding variety was Crimson Cushion, which gave 27½ lb. of fruit from $\frac{1}{330}$-acre. The best yielding variety appears to be Acme, which from the same area gave 55½ lb., though in this case the percentage of bad fruit was rather high. Readers interested in tomatoes should follow these experiments in the Annual Reports themselves. It is interesting to add, that there is every possibility of exporting tomatoes to Canada.

Varietal experiments with yams were again conducted during the year. The varieties grown at the Experiment Station are popular with planters, and there is as a rule, a brisk demand for sets for planting purposes. In these trials, which were designed to test the value of manuring as well as purely varietal characteristics, the produce from the manured plot was, in most cases, less than that from the unmanured. The most remarkable exception in regard to increased yield through manuring is afforded by the variety crop, which, unmanured, gave 151 lb. from $\frac{1}{10}$-acre, and 232 lb. from the same area, manured. From the results of variety trials conducted during the last fourteen years, a variety called Light Red heads the list, with an average yield of 85 lb. per plot. The lowest position is occupied by a variety called Cush, which gave an average figure of 40 lb. per plot. An examination of the figures presented leads one to the conclusion, that not a great deal of reliance can be placed on these average figures, because the variation from year to year is so considerable. For instance, in 1906-7, Light Red yielded 161 lb. per plot, whereas in 1911-12, it yielded only 36 lb. per plot. These fluctuations in yield are probably due to climatic changes rather than to positive characteristics of the plant itself.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture for the West Indies returned to Barbados on February 10, 1915, by the R.M.S. 'Trent', after paying an official visit to St. Vincent.

In view of the depression in the cotton industry, the *Trade Index* of New Orleans, for January 2, 1915, says that it may be necessary to bring about greater diversification of the Louisiana crops. It is pointed out that corn, oats, hay, cattle and hogs can all be produced in the Southern States in unlimited quantities, if the cotton crops cease to be lucrative.

BRITISH EAST AFRICA: ANNUAL REPORT ON THE DEPARTMENT OF AGRICULTURE, 1912-13.

It is a matter for considerable regret that the Protectorate of British East Africa has been brought within range of war operations, for the Annual Report under review makes it evident that this great Possession is in a state of much prosperity as regards trade and agriculture. The publication opens with an interesting table showing the comparative values of the various articles exported and imported from Mombasa during the last six years. An examination of the export figures for 1912-13 shows that during recent years a large and continuous increase has taken place in the amount and value of such exported products as copra, cotton, beans and peas, ostrich feathers, and especially maize (Indian corn). Consideration of the corresponding table of exports brings out the interesting fact that British East Africa, although it is to a large extent a tropical country, does not produce any sugar. The imports of sugar during 1912-13 were worth some £70,000. It is possible that in the near future agricultural systems may be modified in this Protectorate, and that the cultivation of sugar-cane may be substituted for that of other crops, the produce of which may no longer be in such great demand.

On account of the more or less temperate climate experienced up-country, the raising of live stock is one of the chief industries in British East Africa.

Passing over the general remarks made in regard to cattle and sheep—matters that are of no great interest to the West Indies—we may reproduce one or two statements made concerning the pig industry in the Protectorate. It has been recorded in the *Agricultural News* that a central bacon factory has for some time been satisfactorily established in East Africa, and the report on this concern is of interest. It appears that during the past year or two unfavourable results have followed the execution of a policy whereby the company has, in the past, purchased from breeders, animals irrespective as to suitability for the manufacture of the company's products. A short time ago the factory decided to accept only high-class bacon animals; consequently settlers were left with a large number of pigs, which they had to dispose of elsewhere at very low and unprofitable prices. The country is well adapted for pig breeding, and the production of good bacon is beyond doubt, for consignments which have been sent to the home markets have realized within 2*s.* per cwt. of the best Danish. Thus, provided high-grade breeding stock is kept, and the animals are well fed from birth, and primed up on food such as maize (which gives solidity to the flesh produced), the industry is certain to become well established, and extremely profitable.

The account of the various crop cultivations in British East Africa is dealt with in a general way by the Director in his preliminary report, and in a more detailed manner by the Chief of the Economic Plants Division (Mr. H. Powell, formerly of the Agricultural Department of St. Vincent, B.W.I.), in his special report on economic plants. One of the principal cultivations in the Protectorate is that of sisal. On page 13 of the report data are given showing the various yields which have been recorded from time to time. It seems that in British East Africa 1 lb. of fibre is got, on an average, from seventeen leaves. On an average, again, each plant yields 160 leaves. This figure is said to hold good for German East Africa also. The yield of fibre per acre is stated to be just short of 3 tons. In Mr. Powell's report some useful information is given in connexion with the same subject. On account of its more detailed nature, a consideration of this matter will be reserved for another page in this journal.

A most important East African crop is coffee, the value of the exports for 1912-13 being just double those of the previous year, and greater still than those of former years. A slight scare has been created through the discovery of the leaf fungus *Hemeleia Vastatrix*, but there is no reason to believe that the fungus has only just been introduced, and consequently the circumstance of its observation should not necessarily interfere with an extension of coffee growing. Correspondence with India has been carried on with a view to obtaining information as to the best methods of control.

A crop with which much progress has been made as regards yield of produce, is maize. As already stated, the quantity exported has been continually rising, but the quality is not of a high standard, and this is said to be due largely to the prices paid to natives being usually the same for selected as for mixed grain; in consequence, there is little incentive to grade. It is stated that there is great need for a large warehouse, to hold some 2,000 to 3,000 tons of corn, where each bag of corn can be inspected, and stored until shipped. Although no regular system of examination has been in vogue, careful efforts have been made to check the export of weevilly maize, and when the weevils were detected in any consignment, the whole was submitted to fumigation. It is hoped, in the future, to be able to follow the example of South Africa, and institute Government brands for Indian corn. In the coastal regions, where the climate is more intensely tropical, coco-nuts are a thriving crop: but for some time the trees have suffered considerably from the attacks of the palm beetle Oryctes. The Plant Inspector has been travelling in this district with a view to encouraging the natives to destroy infested trees, particularly those lying on the ground.

Because of the great variation in the climatic conditions of British East Africa, it is to be expected that the kind of crops grown are very diverse. In fact, at the higher elevations (6,000 feet), wheat and alfalfa thrive. Here the temperature ranges between 42° and 78° F. At a lower level, where irrigation is possible, cotton is a satisfactory crop to grow, and as already pointed out, the value of the exports of this product have rapidly increased, being 7,580 rupees in 1907-8, and 556,241 rupees in 1912-13 (10·78 rupees =£1 sterling).

We may conclude this review with a few notes on the veterinary information incorporated in the publication. In certain districts East Coast fever and rinderpest are common amongst stock, whilst horses appear to suffer considerably from epizootic lymphangitis—a disease well known in the West Indies. Trials have been made to cure this disease by treatment with salvarsan (606). It is said that it has a marked effect when used in a sufficiently early stage of the disease. Excision of the diseased tissue, followed by the application of iodine, is also practised with good results in the early stages of the disease. In order to prevent spread, all affected animals are isolated if possible. Amongst pigs, swine fever and anthrax have been somewhat prevalent.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

Local Agents: Advocate Co., Ltd., Broad St., Bridgetown. *London Agents*: Messrs. Dulau & Co., 37, Soho Square, W.; West India Committee, Seething Lane, E.C. The complete list of Agents will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the sugar situation. An attempt is made to outline the probable position during the coming year, and the action which may be taken in regard to sugar supplies in following years.

Under the heading of Sugar Industry, on page 50, will be found two articles, one dealing with the question of British-grown beet, and the other describing the advantages attendant on the employment of grooved sugar mills.

Important experiments, from the point of view of the estate, are described in an article on page 52, which deals with the budding of cacao.

The commercial handling of maize in Antigua, and the consumption of this corn in different forms by swine, are dealt with in two articles on page 53.

Agricultural conditions in British East Africa are described under the heading of Departmental Reports, on page 55.

An important note in connexion with recent legislation against citrus canker will be found on this page. The subject of this disease, from the administrative point of view, will be dealt with editorially in our next issue.

United States Quarantine against Citrus Canker.

Mr. C. W. Martin, American Consul at Barbados, has forwarded to this Office, the following information relative to the Notice of Quarantine, No. 19.

The fact has been determined by the Secretary of Agriculture that a dangerous disease of citrus plants, known as the Citrus Canker, and also other citrus diseases, new to, and not heretofore widely prevalent or distributed within and throughout, the United States, exists in Europe, Asia, Africa, South America, North America outside of the United States, and foreign Oceanic countries and islands, and are coming to the United States with imported citrus nursery stock.

An Act has been passed to prevent the further introduction into the United States of citrus canker and other citrus diseases, to forbid the importation into the United States of all citrus nursery stock, including buds, scions and seeds, from the foreign countries and localities named, and from any other foreign locality or country.

On and after January 1, 1915, and until further notice, by virtue of the said Act, the importation from all foreign localities and countries of citrus nursery stock, including buds, scions and seeds, except for experimental or scientific purposes by the Department of Agriculture, is prohibited.

The term 'citrus' as used herein shall be understood to include all plants belonging to the sub-family or tribe Citratae.

Attention will be given to citrus canker editorially in the next number of the *Agricultural News*.

Effect of the Tropics on the Blood.

The question of the influence of a tropical climate upon the blood of children of European descent is dealt with in the *Annals of Tropical Medicine and Parasitology* (December 15, 1914), in a paper by A. Breinl and H. Priestley, of the Australian Institute of Tropical Medicine. The investigation on which the paper is based was carried out in Queensland, and some very interesting results, possibly applicable in the West Indies, were obtained. It is worthy of note that previous investigations on the same subject have led to more or less contradictory results, but the present conclusions, being based on a large number of observations, may be considered as fairly well established.

The conclusions are as follows. Careful blood examinations performed on 574 school children in Townsville, Queensland, of European descent, of ages between seven and fifteen years, of whom the majority had been born and had resided in Tropical Queensland during their whole life, indicated (1) that the average number of red blood corpuscles is not diminished when compared with analogous figures for children born and bred in a temperate climate; (2) that the average haemoglobin content of the blood is normal; (3) that the number of leucocytes (white corpuscles), is slightly increased; (4) that the average blood pressure does not show any difference from that of normal children in temperate climes.

Agricultural Credit Societies.

In a paper read before the International Congress of Tropical Agriculture, Mr. J. M. Doine dealt with co-operative societies, principally in regard to India; but although personally unacquainted with the West Indies, he made some observations on the position here. The author looked to the East Indian immigrants as the most likely section of the people in the Western Tropics to take up self-governing societies successfully, but he recognized that the Land Settlement system is a great help in the establishment of societies among the native peasantry. He emphasized the folly of adopting a too elaborate system of accounts at the first, since this puts too much strain on the elected officials. Mr. Doine regarded the co-operation of the Church a very important factor in securing permanent success.

The writer is apparently unfamiliar with the more recent West Indian literature on the subject. No reference is made to the St. Vincent Agricultural Credit Ordinance, which was passed in 1913, and published in the *West Indian Bulletin*, Vol. XIV, No. 1, together with a report on the working of the Credit Societies in that Colony. St. Vincent is the only British possession, excluding India, which possesses legislation for the provision of Raiffeisen banks. The circumstance is of importance, even if only from the point of view of its being a valuable experiment from the results of which other Colonies are bound to benefit negatively, if not positively.

Agriculture in Zanzibar.

By far the most important product of Zanzibar (which now comes under the jurisdiction of the Colonial Office) is cloves. The exports from this important industry in 1913 were worth £428,692. During that season the crop harvested was an exceedingly large one, the value of the exports being greater than those of previous years. The average yield per annum from a plantation of about 3,000 trees of about sixty years old, owned and managed by Europeans, is £8 per tree. Ninety-eight trees are planted to the acre.

Coco-nut cultivation ranks next in importance after cloves. It is estimated that there are about 45,000 acres under coco-nuts in Zanzibar. Copra produced on the Government plantations has been most favourably reported on by London brokers. The copra exported in 1913 was worth £216,842.

As regards land grants, it is interesting to note there are a number of plantations in the hands of the Government, and under the control of the Department of Agriculture, with an area of about 16,000 acres. These fine properties formerly belonged to the Sultans of Zanzibar, and the Government policy in retaining them is influenced by the desire to keep them under efficient management, and free from mortgage, until such time as reliable planters are found to take them over. As a general rule there is much scope for European enterprise in Zanzibar. Communication and climatic conditions have greatly improved during the last year or two, so that future prospects for development may be regarded as favourable.

Utilization of Sun Power.

An interesting paper was read at the International Congress of Tropical Agriculture on the Utilization of Sun Power for irrigation and other purposes connected with agriculture in the Tropics. The principle involved in these machines is the concentration of radiant energy by means of mirrors on to boilers enclosed in glass cases to check radiation.

Mr. F. Shuman stated that results of tests of the sun power plant near Cairo in Egypt had been satisfactory. It is estimated that power can be produced in the Tropics at the same cost as if coal were less than 10*s.* per ton; and as coal in many parts of the Tropics costs £2 10*s.* per ton, upwards, the saving to be effected by means of sun power plants is quite obvious. Though sun power plants cost more than coal-burning plants, the saving effected by not requiring any fuel is sufficient to wipe out the extra capital cost after two years, and in four years to pay entirely for the whole equipment.

Discontinuity in sunlight is overcome by the art of using low pressure steam: boiling water is stored in tanks and the steam drawn upon as required.

British Agriculture and the War.

An influential concourse of expert advisers recently assembled in London at a meeting of the Agricultural Education Association to discuss 'Agricultural Products Deflected by the War.' *Nature* for December 31, 1914, gives a summary of the remarks made by Dr. Russell, Director of the Rothamsted Experimental Station, in opening the discussion. The Director pointed out that the present duty of the farmer was to increase the saleable output from his farm, particularly of those things which the community needs most. Reference was made to the importance of substituting for home-grown foodstuffs, in the rations for British live stock, by-products from the Tropics. In this direction, as well as in others, short rapid trials are necessary rather than prolonged and more accurate ones. If changes are to be made they must be effected at the earliest possible moment.

In time of peace the price of cereals is lower than at present. The reduction in the amount of produce grown on the farm for farm consumption would make room for a desirable increase in the area under wheat. In considering substitution of crops, an important problem is the possibility of making rearrangements, whereby products, not likely to be in much demand, shall cease to be produced. Early cucumbers, for example, have hitherto gone almost entirely to Germany, and this fact has luckily been realized in time to prevent usual production.

In conclusion, Dr. Russell stated that the time was appropriate to urge on all farmers the need for reducing all waste to a minimum. It can never be too strongly urged that waste is a sign of bad farming, and the present is a good time for reform.

INSECT NOTES.

PESTS OF CACAO.

The following is a summary of the notes on insect pests of cocao given in van Hall's book *Cacao*, referred to in the insect notes in the last issue of the *Agricultural News*:—

The West Indian Mole cricket (*Scapteriscus didactylus*,) which is known in British and Dutch Guiana, and in the Antilles, is at times a serious pest of young cacao plants in the nursery and field. The mole cricket feeds underground on roots. The young and adult forms tunnel through the soil, ranging in depth from just beneath the surface to a foot or more. They eat roots of many sorts, and even those that are not accepted as food are often nibbled enough to be injured. Cacao seedlings are attacked just at the point of juncture of the stem and root. In this way it happens that many plants are killed by a few mole crickets in one night. Since only the young cacao plants are attacked by the mole cricket, the remedy for plants in the field is simple.

Young plants may be raised in pots in the nursery, being carefully protected from this insect until they are of sufficient size and strength to escape injury. They are then planted in the field.

The nurseries may be kept comparatively free from mole crickets by frequent turning up of the soil, and the destruction of the insects, in which the common fowl is very useful. Poison may be applied also as a poison bait, which is made by mixing 3 lb. of arsenic with 100 lb. of horse-dung, and distributing this in the soil. This amount is recommended for 1 acre.

The cacao tree is subject to attacks by borers in most countries where this crop is grown. 'The life-history of these different enemies varies in detail, but in many respects their mode of life is the same, and accordingly, the fight against the various borers proceeds everywhere along the same general line.

'The beetle or moth lays its eggs against the stem, or against a branch, often in a little hole made for the purpose in the bark. The larva or worm lives for some time in the bark or in the wood, and damages the tree to a greater or smaller extent. Often the presence of one borer may cause the death of a whole branch, which then looks as if it had been killed by fire, as all the brown and dry leaves remain hanging on the twigs. Whole trees, especially young ones, may be killed in this way when the borer lives in the stem. At present the general way of fighting the borers is to remove the "worms" or larvae, cutting away the bark by means of a knife until the worm is exposed. On many plantations a gang of trained worm pickers is kept for this purpose. If possible, these men also collect the perfect insects—whether beetle or moth—but generally the number of captured perfect insects is small in comparison with the number of captured worms.'

The boring insects which attack cacao in different countries are described as follows:—

The West Indian cacao borer (*Steirastoma depressum*) is one of the worst pests of cacao in some of the Antilles, and in various countries in South America. The Glenea borer (*Glenea novemguttiata*) is the most common and most destructive kind of cacao borer in Java. The Pelargoderus beetle (*Pelargoderus bipunctatus*), and the Monohammus beetle (*Monohammus fistulator*) rank next to the Glenea as serious borers of cacao. In Kamerun, an allied Monohammus borer (*Monohammus ruspator*) is recorded as a pest of this crop. The large Catoxantha beetle (*Catoxantha bicolor*) has also been a borer pest in Java, and it is known to occur in British India. Shot borers of the genus Xyleborus are recorded as doing damage to cacao at times in certain countries, e.g. Trinidad and Java. The larva of a Bombycid moth, (*Zeuzera coffeae*), which is fairly common in Java, is at times a serious borer in cacao.

Of the insects which attack the leaves, twigs and fruits, the Helopeltis is the worst in Ceylon, and only second in importance in Java. There are two speices—*Helopeltis theivora*, and *H. antonii*, the former of which is prevalent in very hot climates while the latter in the more common species in the cooler regions.

The eggs of these insects are laid in the young fruits, and at times in the tender twigs.

The larvae and adults feed upon fruits, twigs, and leaf stalks of the cacao, but not on the leaf blade. The mouth parts are of the sucking kind, fitted for piercing plant tissue and sucking out the juices.

During the dry season the numbers of Helopeltis are small, but in the rainy months they increase to enormous numbers and cause great damage.

The fight against these insects is rendered more difficult because they live on many different plants.

The methods of control consist in collecting and burning. The collecting is done by means of a stick of bamboo with a ring of bamboo or a kind of fork at the end. The ring has a diameter of about 3 inches. This is passed through a cobweb until it is more or less covered with web, and it is then used by the labourers to catch the adult Helopeltis. The viscous juice of the Jack tree is sometimes used in place of cobwebs. Burning is accomplished by means of a bamboo stick filled with kerosene, and fitted with a cotton wick. With this as a torch, the fruit are lightly scorched over, and many Helopeltis are killed, but neither this nor the catching method is very satisfactory. Helopeltis seem to have very few natural enemies, and no diseases are known which exercise any control over them.

It is stated that an ant, *Dolichoderus bituberculatus*, Mays, has been introduced into cacao fields with marked success in reducing the numbers of Helopeltis, although the ant does not attack the Helopeltis. The author does not say, however, why or how the introduction of large numbers of the ant accomplishes the result.

The Rind bug (*Sahlbergella singularis*) is stated to be the worst insect pest of cacao in Kamerun. This is also a sucking insect, which punctures the bark or rind of young twigs and inflicts serious injury. Good results in controlling this insect have been obtained from spraying with a mixture of Paris green (40 grams), kerosene (3 litres), soap (1 kilogram), lime (1 or 2 kilograms), and water (100 litres). A 1-per cent. decoction of tobacco has also been used with success, and burning, as in the case of Helopeltis, is likewise effective.

The Moqguilla is the worst pest of cacao in Ecuador. This is an unidentified hemipterous insect, which in both larval and adult stages feed on the developing pod. Every puncture made by the mouth parts of these insects results in a discoloured spot, and when these spots are numerous, as they often are, the whole pod turns black and does not develop properly. The pest has been known in Ecuador for the past twenty-five years, and at present occurs throughout the entire coast region. In some seasons it is so serious that practically no sound cacao is secured. Very little is known about the life-history of this insect, and no effective methods of control seem to be known.

Leaf-eating caterpillars are not serious pests of cacao.

The cacao thrips (*Heliothrips* [Physopus] *rubrocinctus*), which occurs in the West Indies and Surinam, is mentioned as being at times a serious pest. Spraying with kerosene emulsion, which has been found successful in Grenada, has not given satisfactory results in Surinam.

In Java, the cacao moth (*Zaratha cramerella*) is a most serious pest on many plantations, causing greater losses even than the Helopeltis.

The larvae of this small moth live in the cacao pods, tunnelling through the wall of the pod into the seed cavity, and though they do not attack the seeds, these are often spoiled as a result of the injury to the pods and the pulp.

Only one method of control has been successful, that known as 'rampassing', which consists in picking all the fruit at a definite season of the year, and destroying them. The first picking, which occurs some five months after rampassing, yields fruits which are nearly all free from moth attack. Each subsequent picking yields larger and larger numbers of infested pods, until nearly all are infested.

Attacks of birds do not cause much loss in any cacao-producing country, although a certain number of pods are attacked, and the seeds eaten.

Rats and squirrels are serious pests in many localities, but these may often be checked by the judicious use of poisons.

Deer and pigs also cause injuries which at times, and in certain countries, are serious. The deer injure the trees by rubbing the bark off, while the pigs, in digging for grubs and other food, often injure the roots of the trees, and sometimes wholly uproot young trees.

TICKS IN RELATION TO DISEASES OF STOCK.

During the last two or three years the tick question has received special attention by the Imperial Department in the Windward and Leeward Islands, and several papers have been published as a result of the work done. For a longer period in Jamaica trials have been made with sprays and dips to eradicate these pests. In connexion with this work, a publication recently received from Messrs. Cooper and Nephews, M.R.C.V.S., of Berkenstead, England, will be of interest to planters in the West Indies. This booklet explains the anatomy and life-cycles of ticks, and the nature of the diseases which they transmit. Especially interesting, on account of the practical experience of the authors in all parts of the Tropics, is that section devoted to the methods of eradication. The various poisonous solutions employed as dips are described, as well as what are known as 'starvation methods' of eradication. This latter system involves the idea of causing ticks to live in a pasture for a certain time, in the absence of a suitable host. There are several methods that can be employed in carrying this out, and the best known is perhaps the pasture rotation method, which includes a tick-free cultivated section, and three cropped fields all separated from one another by fences. The method of procedure is described in considerable detail.

The publication concludes with an account of Coopers' spraying and dipping appliances, one of which was used with considerable success recently in Antigua. Accompanying the publication is a reprint of a paper entitled Tick Eradication in the West Indies (an account of cattle-spraying operations in Antigua), by Mr. P. T. Saunders, M.R.C.V.S., formerly Veterinary Officer on the staff of the Imperial Department of Agriculture.

NOTES ON ANTS.

The Curator of the Botanic Gardens in Dominica forwards a letter from a planter in that island, who refers to the article in a recent number of the *Agricultural News* (see Vol. XIII, p. 376, November 21, 1914), in which is given an abstracted account of a species of ant occurring in the Seychelles.

The following is quoted from the letter:—

The writer of the article considers that it is the fact that ants protect certain scale insects, but it is not proved that they do more.

I have seen the small black biting ant carrying the flat transparent scale to plant it on the under side of the leaf of a small grafted mango. Also doing the same thing on new shoots of orange.

The same ant is the one that makes the earthern coverings to the mealy scale on pine-apples from the ground-level up: also on Callalloo and other plants.

Personally I have been convinced for a long time that the ant is responsible for the spread of many injurious insects. It roams over the whole land here, and I believe it selects by instinct or by trial every plant or tree that suits those insects of which it can make use and then starts the colonies of them.

I am under the impression that the large black biting ant also cultivates insects for use, but in this case altogether underground and possibly on roots.

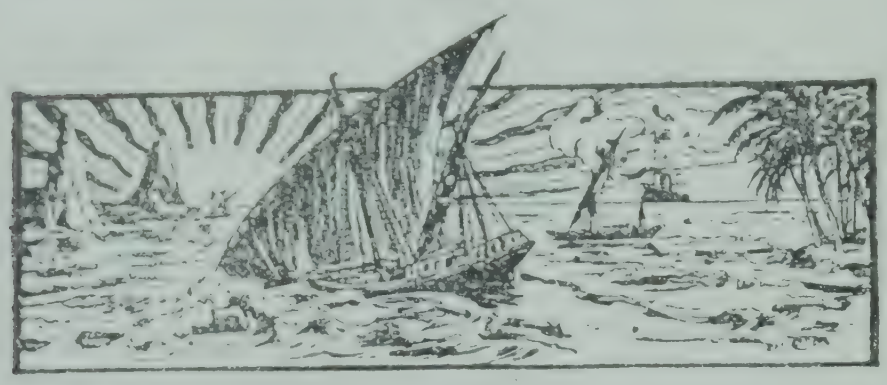
If there is any practicable method of abolishing ants, I should be very glad indeed to hear of it.

The Imperial Department has made recommendations for the destruction and control of ants, and it would be of interest to know whether trials of the remedies or methods suggested have given any conclusive results in the West Indies.

The following references in the *Agricultural News* to recommendations for the control of ants may be mentioned: Vol. X, p. 346, Vol. XIII, pp. 298 and 392. In the Pamphlet No. 71, Insect Pests of the Lesser Antilles, ants and their control is discussed at page 147.

Work in the Experiment Station and Botanic Garden, St. Lucia, during December, included the distribution of lime plants, the picking of cotton, road making, painting sugar works, gates and fences, sowing lime seeds, and other operations. Nearly the whole of the labour in the Botanic Garden was employed throughout the month in breaking coral, and repairing the roads throughout the Garden.

According to a recent quarterly report forwarded to this Office from the Acting Curator, Tortola, Virgin Islands, this season's cotton crop has been quite early, and during the period under review, i.e. the quarter ended December 1914, 61 bales of 220 ℔. each of lint were ginned and baled at the Cotton Factory. It is stated that the growers view the market situation with considerable apprehension, but those who sell to the factory, at which the price has been reduced from 7c. per ℔. to 5c., seem to regard, on some sides, the reduction with reasonable satisfaction.



GLEANINGS.

The importance of grading eggs for market is very great, and this subject is dealt with in Leaflet No. 13 of the English Board of Agriculture and Fisheries, under the general heading of marketing of eggs. The testing of this produce is also discussed.

It is reported in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, for October 1914, that recent research in Berlin has proved that it is quite out of the question to think that bees have a sense of colour in any way comparable with that possessed by man.

The English Board of Agriculture and Fisheries Leaflet, No. 285, gives a useful practical account of bacon curing on the estate. The weight of pigs, slaughtering, preparing the carcass, curing, pickling, and smoking are all dealt with in considerable detail.

A paper in the *Biochemical Bulletin* for April and July 1914, deals with the effect of salicylic aldehyde on plants in soil and solution cultures. As regards its effect on the growth of Indian corn, growth in the treated plots was much smaller than in the controls. The effect of salicylic aldehyde in sand is greater than in clay soil.

The shipments of cacao for the year ended December 31, constituted a record for the Colony of Trinidad. They amounted to 63,447,876 lb., against 48,116,377 lb. in 1913. Prices might have been better, but these have been quite equal to the average of the last seven years. (*Proceedings of the Agricultural Society of Trinidad and Tobago*, December 1914.)

In connexion with the note on dry farming on this page, it is interesting to observe that, according to the *Agricultural Gazette of Canada* (November 1914), the field crops of the Dominion for 1914 were many thousands of tons short of a normal yield, owing to insufficient moisture available during the growing season. The importance of dry-farming systems under these conditions is obvious, especially where irrigation is out of the question.

Those responsible for the management of school gardens will find much that is interesting on the subject in the Eleventh and Twelfth Annual Report issued by the West of Scotland Agricultural College, to be obtained on application to the Secretary, price 1*s.* post free. A scheme of work, note books to be kept by pupils, and syllabus of instruction are given. The whole scheme is naturally adapted to temperate conditions, but the methods suggested will easily bear consideration from a West Indian standpoint.

Several comprehensive experiments have been carried out with a view to preserving cut flowers by the addition of salts to the water in which the stalks are placed. In no cases have any striking results been obtained. The best treatment to adopt is to add a *trace* of zinc sulphate or of copper sulphate to the water, which will prevent fouling, due to bacterial action. Daily removal of the cut end of the stalks has been found to prolong the life of the flower. These, and other facts on the same subject, are discussed in the *Gardeners' Chronicle* for December 26, 1914.

In the issue of *Nature* for January 7, 1915, Sir Ronald Ross contributes an article entitled Attempts to Manufacture Scientific Discovery. The writer draws an interesting distinction between major discovery and minor research. Those engaged in the former kind of investigation need almost unlimited freedom, whilst in the case of the latter, there is more possibility for the introduction of systems of co-ordination and centralization. Real discovery, involving entirely new ideas, requires a peculiar and rare type of mind, which cannot be forced, and only superintended to a very limited extent.

According to *Colonial Reports*, Annual, No. 809, the Bahamas in 1913-14 exported sisal, valued at £69,950. All this went to the United States of America. Some £563 worth of grape fruit was sent to the same country. The export of oranges was valued at £599 compared with £172 for the preceding year. The export of coco-nuts has also increased. The pine-apple canning factories had a rather better year during 1913, though their record season was in 1910, when the value of tinned pine-apples shipped was £9,219, compared with £6,208 for 1913.

The objects of deep ploughing are summarized as follows in the agricultural section of the *Wealth of India* (September 1914): (1) to destroy and prevent the growth of weeds and other vegetation not desired upon the ground; (2) to place beneath the surface, manure and organic matter, where it will not be in the way, and where it may be converted rapidly into humus; (3) to develop various degrees of openness of texture and uniformity of soil conditions; (4) in some cases to modify the movements of soil moisture and of soil air; and (5) to change conditions so as to make the soil either warmer or colder. Deep ploughing is an essential part of dry farming. Associated with this system also is the maintenance of a dust mulch at the surface of the soil.

Considerable discussion has taken place recently in connexion with the proposed revival of the natural indigo industry, especially in India. Matter dealing with the subject appears in the *Journal of the Royal Society of Arts* for January 1 and 8, 1915. The first paper was read by Dr. Perkins, and in the discussion, Sir Steuart Bailey put forward the opinion that although during the next two or three years the market would be favourable for natural indigo, it was doubtful whether in succeeding years the position would be any better than in the past. It seems to be generally agreed that the prime effort must come from the growers themselves. In the second issue of the publication already referred to, Professor H. E. Armstrong makes a point of this, and says that the recovery of the position of natural indigo may be a costly business, but if one-tenth of the zeal put by the Germans into the production of the artificial treatment be brought to bear on the problem, he believed it would be solved satisfactorily.

STUDENTS CORNER.

Seasonal Notes.

Concurrently with the reaping of sugar-cane the Intermediate and Final student should endeavour to obtain data to show the degree of efficiency of the factory with which he is connected.

The following interesting figures will indicate the kind of information that might be obtained. These figures are actual results obtained on two estates in Barbados. The factory on the first estate is equipped with an 8-roller mill and vacuum pan; on the second, the open pan method is employed, and the sugar separated in the centrifugals.

ADVANTAGE OF UP-TO-DATE MACHINERY OVER OLD-FASHIONED, IN PRICE GOT FOR SUGAR.

A. New Machine (steam) 10 tons cane.

Dark crystals, 1 ton, at $2·15 per 100 lb. of sugar	$48·16
Vacuum pan molasses, 40 gallons at 6c. per gallon	2·40
	$50·56

B. Old Machine, 10 tons canes.

Centrifugal sugar, $\frac{10}{17}$ ton, at $2·60 per 100 lb.	34·25
Molasses, $\frac{1000}{17}$ gallons, at 16c. per gallon	9·41
	$43·66

Gain of A over B.=69c. per ton cane. Difference $6·90 for 10 tons.

The present time is opportune for noticing the suitability of different varieties of cane for different localities. The student should notice carefully the varieties on the experimental plots, and make notes and, if possible, estimates, in yield per acre, and compare these notes as far as possible with the official results, which will be published early next year.

Questions for Candidates.

PRELIMINARY.

1. Name some common plants in which starch is produced in quantity, and state in what part of the plant the starch is stored.

2. Explain the difference between Pollination and Fertilization.

INTERMEDIATE.

1. Describe the preparation of cassava and arrowroot starch.

2. Describe carefully the appearance of a good sample of either (a) concentrated lime juice, or (b) cane syrup. Explain how the one you select is tested.

FINAL.

1. Discuss the establishment and value of wind-breaks from as many points of view as possible.

2. State fully the uses that are made of the by-products on an estate with which you are acquainted.

Of two alternatives, a short crop and high prices is better for the planter; but a heavy crop and low prices is better for the labourer. Both are satisfied with high prices and heavy crops.

A FLYING-FISH PARASITE.

The flying-fish (*Exocoetus roberti*), which is especially abundant in the sea off the coast of Barbados, is often found when captured to be attacked by a parasite, which is partly embedded in the flesh of the fish, and partly protruding. The fishermen and others who are familiar with these parasites speak of them as 'feathers'.

Specimens recently forwarded to the British Museum (Natural History) have been reported on, and the report is reproduced in the following paragraph:—

FLYING-FISH PARASITE FROM BARBADOS, SENT BY DR. FRANCIS WATTS, C.M.G.

'The two specimens are parasitic Copepoda (Crustacea) of the genus Pennella. They probably belong to the species *P. exocoeti* (Holten), but the head is absent in one and very badly damaged in the other, so that the specific characters cannot be determined. The Museum would be glad to receive perfect specimens. Unless the parasite can be very carefully dissected out on the spot, the whole fish should be preserved, and specimens should be looked for which carry egg-strings—a pair of long, light-coloured filaments attached at the free end of the animal, easily to be distinguished from the brush of short, dark-coloured filaments which are believed to act as gills. The life-history of the genus is no doubt similar to that of the genus Lernaea which is described in most text-books.'

The following, taken from the Cambridge Natural History, is presented herewith as likely to be of interest in this connexion.

FAM. II. LERNAEIDAE. These parasites burrow with their heads deep into the skin, or even into the blood-vessels or body-cavity of various marine fish. The body of the adult female Lernaea is extraordinary deformed, consisting of a mere shapeless sac with irregular branched processes on the head, and two egg-sacs attached behind. *Pennella sagitta* bores so deeply into the flesh of its host, *Chironectes marmoratus*, that only the egg-sacs and some remarkable branchial processes attached to its abdomen protrude outside the host to the exterior. *Peroderma cylindricum* bores similarly into the flesh of the Sardine, and where it is common, inflicts considerable damage. The males of these curious animals are of more normal structure. Claus states that fertilization takes place when both sexes are free-swimming, and of a more or less similar structure, and that subsequently the female becomes fixed to her host and degenerates into the shapeless mass shown.

Imports of Corn into Trinidad.—A note of interest appears in the *Bulletin of the Department of Agriculture*, Trinidad and Tobago, for November-December 1914, showing the extent of the imports of Indian corn into that Colony from 1899 up to 1911. Although there is a much larger quantity of maize imported into Trinidad than is necessary, it should be remembered that there has been a steady reduction in the imports during the period under review. In 1899, the imports were nearly 4,000,000 lb.; this figure dropped steadily down to 1,000,000 lb. for 1911. It is pointed out that it should not be necessary to import Indian corn into Trinidad at all, since the crop can be easily grown in that island, where its method of cultivation is so well understood. One million pounds represents in round numbers the cultivation of another 1,000 acres of land, the produce from which would find a ready sale in the local markets.

FUNGUS NOTES.

MORE ABOUT CITRUS CANKER.

The Florida Agricultural Experiment Station has published in Bulletin 124, issued October 1914, three papers on the new citrus disease, which are summarized below.

I. HISTORY OF CITRUS CANKER, E. W. BERGER.

The realization that a new citrus disease was present in Florida took place in July 1913, when it was found in several blocks of grapefruit at a certain nursery. Specimens had been received from another locality a year earlier, but were supposed at that time to show merely an unusual form of citrus scab. The infections were traced partly to importations of *Citrus trifoliata* from Texas, partly to stock obtained direct from Japan. It transpired later that the disease was present in Alabama, Mississippi, and Louisiana.

An order was issued prohibiting importations of citrus plants into Florida; a fund was raised to which the Florida Growers' and Shippers' Association contributed $2,000, and the Governor of Florida $1,000; and a campaign was started against the disease.

II. STUDIES OF CITRUS CANKER, H. E. STEVENS.

Grapefruit is most severely attacked, the infection occurring on leaves, twigs, branches and fruits; then in order of susceptibility follow *Citrus trifoliata*, and the navel and some of the sweet orange varieties, which are affected on leaves, twigs, and fruits. Scattered infections have been found on the leaves and twigs of Satsuma, tangerine, lime, and rough lemon.

'The distinguishing feature of citrus canker, as observed in the field, is the characteristic spotting produced on the fruit and foliage. As usually seen, the infection appears as small light-brown spots, from less than $\frac{1}{16}$ to $\frac{1}{4}$-inch in diameter. The spots are usually round, and may occur singly, or several may run together, forming an irregular area. This last usually occurs on fruits. The spots project above the surrounding healthy tissue, and are composed of a spongy mass of dead cells covered by a thin white or greyish membrane. The membrane finally ruptures and turns outward, forming a lacerated or ragged margin around the spot.

'On the leaves, infections first appear as small, watery dots, with raised convex surfaces. These dots are usually of a darker green than the surrounding tissue. Sometimes, however, the surface of the spots is broken as soon as they appear. Spots may appear on either surface of the leaf, but they do not at first penetrate through the leaf tissue. They gradually increase in size, change to a light brown, and become visible on both sides of the leaf. In the older spots one or both surfaces may be bulged or raised, and such spots are commonly surrounded by a narrow yellowish band or zone. In the more advanced stages the surface of the spots becomes white or greyish, and finally ruptures, exposing a light brown spongy central mass. Old spots soon become overgrown by saprophytic fungi, and may appear pink or black on account of these fungus growths.

'On the fruits, the spots are very similar to those formed on the leaves. They project and retain a circular outline. They do not penetrate far into the rind. They may be scattered over the surface, or several may occur together forming an irregular mass. Gumming is sometimes associated with the spots formed on the fruits. Canker, apparently, does not cause a rot of the fruits directly, but opens the way for other fungi to enter and cause infected fruits to rot. The spots on young twigs are like those on the leaves and fruit. On the older twigs they are more prominent, and more or less irregular in shape. This is especially true of old spots. They show the same spongy tissue as is found in the spots on the leaves, but assume a cankerous appearance, and the surface membrane completely disappears. These spots or cankers are formed in the outer layers of the bark tissue, and do not penetrate to or kill the wood. The spots once formed in the bark are persistent, and are not readily sloughed off. They may remain for a long time, and form centres from which infections may readily spread. This is confirmed by observations on infections produced on potted trees in the greenhouse, and in the grove by artificial infection. Some of these spots have been under observation for over a year, and show no tendency to slough off.

'Other citrus diseases with which canker may be confused are Scab, Scaly Bark, and possibly Anthracnose. It can, however, readily be distinguished from any of these by noting the following points:—

'1. It differs from scab in the typical round spots produced; the size of the spots, and the fact that the spots penetrate through the leaf tissue. It does not distort the leaves. There are no wart-like projections. Canker occurs on older wood, Scab does not.

'2. Canker differs from Scaly Bark in the size of the spots, which are much smaller aud more circular than those of Scaly Bark; and the spongy nature of the spots—Scaly Bark spots are hard and glazed. Canker is common on grape fruit, Scaly Bark is not. Canker forms spots on leaves, Scaly Bark does not.

'3. Canker differs materially from Anthracnose in the size of the spots, which are much smaller than those of Anthracnose. Canker spots are raised, Anthracnose spots are sunken. Canker has spots of spongy character, those of Anthracnose are hard. Canker occurs on young shoots and older twigs, Anthracnose does not.'

Experiments in which dry infected material was pinned to young healthy foliage showed that the disease was infectious. Small watery spots appeared in one month, and these had developed in two months into the spots typical of the disease. A fungus was isolated from the young spots, and afterwards identified among those present on the older spots. Infection experiments from pure cultures gave positive results in two out of many instances.

The fruiting bodies of the fungus are small globular pycnidia, which exude the colourless spores in thread-like tendrils. The pycnidia are somewhat difficult to distinguish from the tissues of the spots.

The disease spreads with great rapidity in rainy weather; infection proceeds from the old spots even after these have passed through a winter.

III. ERADICATION OF CITRUS CANKER, FRANK STIRLING.

Mr. Stirling was employed by the Growers' League to try to clear up the disease first of all in Dade County, a district in which the grape fruit industry is developing very rapidly. He tells his story very dramatically.

At the outset some 200,000 nursery trees and over 500 acres of grove trees were cut back, defoliated, and the trunks painted with Bordeaux mixture or carbolineum. 'At this juncture everyone began to breathe a little easier.' As the inspection proceeded, more and more infection was found, and more and more was treated. The number of infected properties rose to nearly a hundred. Then with the new growth on the trees came the shock of finding that the work had been carried out in vain; that instead of checking the disease, the activity of the workers had actually contributed to its spread.

The next method adopted is even more heroic. A flaming spray produced by a machine 'which resembles a plumber's blow-torch, only a hundred times larger,' is used to scorch the tree, the grass, and the soil beneath, until the tree is completely charred. In one district 1,933 grove trees and 101,300 nursery trees have been burned. Some fifty men are employed on the work.

When leaving one grove for another, each man changes his suit, the discarded one being disinfected with corrosive sublimate solution. No one is permitted to touch a tree.

According to Stirling, 'canker is without doubt the most infectious of any known disease.' A certain 4-acre grove of grape-fruit trees, inspected in the first week of June, was to all appearances free of canker. Three weeks later one tree began to show a slight infection upon one limb. Four days later canker was found on five trees; in another week the number infected was twenty-seven, and there would have been no difficulty in picking fifty boxes of diseased fruit. Canker is so deadly that a tree is rendered worthless in two or three months from the time of infection.

It will be seen that the citrus canker situation in Florida is affording us the spectacle of an attempt absolutely to eradicate a disease which has already become well established, and that in a district which must always be exposed to reinfection over the land frontier of the State. The odds against success are great, but the cost of failure would be very heavy. 'It would be merely a matter of months before the canker would be entirely over the orange belt.' The moral for the citrus-growing islands of the West Indies is obvious.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of December :—

It is satisfactory to be able to report that the amount of businees done in the drug and spice markets during the early part of December, has shown no diminution since our last report, taking, of course into consideration, that the approach of the Christmas holidays, even in peace times, always has the effect of lessening the ordinary activity, which is made more prominent by the annual stocktaking, so that taking all these things into consideration, we may distinctly say that the markets are back to about their normal condition. With regard to the position of individual products as compared with our last report, we may say that citric acid and lime oil were easier than they were at the close of last month, the former however becoming firmer at the time of writing.

The following are the principal details:—

GINGER.

At the first spice sale on the 9th of December, the quotation for middling to good Jamaica was 40*s.* to 45*s.* per cwt., 35*s.* to 36*s.* for common, and 22*s.* to 23*s.* for washed Cochin. A week later some 213 bags of Calicut were brought forward, 45 of which were disposed of without reserve at 18*s.* 6*d.* for small washed. Some fair washed Cochin was offered and bought in at 24*s.*

NUTMEGS, MACE, PIMENTO, AND ARROWROOT.

At auction on the 16th, the very large supply of 544 packages of West Indian nutmegs was brought forward, and all were disposed of at the following rates: 61's to 72's $6\frac{1}{2}d.$ to 11*d.*, 74's to 85's 5*d.* to $6\frac{1}{2}d.$, 86's to 94's $4\frac{1}{4}d.$ to $4\frac{1}{2}d.$, 98's to 109's $4\frac{1}{4}d.$ to $4\frac{3}{4}d.$, 110's to 120's $4\frac{1}{4}d.$ to $4\frac{1}{2}d.$, and 134's to 145's $4\frac{1}{4}d.$ to $4\frac{1}{2}d.$ Mace at the same auction was represented by 141 packages West Indian, all of which sold, good fetching 1*s.* 3*d.* to 2*s.* 11*d.*, and broken 7*d.* to 1*s.* 8*d.* Pimento has not been in great demand, the price quoted in the middle of the month being $2\frac{1}{8}d.$ per ℔. The same may be said of arrowroot, good manufacturing St. Vincent fetching, in the middle of the month, $2\frac{1}{4}d.$ per ℔., and common, 2*d.* to $2\frac{1}{4}d.$

SARSAPARILLA.

At the first drug auction on December 3, sarsaparilla was represented by 16 bales of grey Jamaica, 22 of Lima-Jamaica, 31 of Mexican, and 25 of native Jamaica. Of the first, only 5 bales were disposed of, 1*s.* 9*d.* per ℔. being paid for roughish quality. Of the Lima-Jamaica, 3 bales of common, part chumpy, found buyers at 1*s.* 8*d.* per ℔.; and for 12 bales of the native Jamaica, dull yellow to fair red, 10*d.* to 1*s.* per ℔. was paid. The Mexican found no buyers, but a week later Mexican in fair quantity was to be had at from 8*d.* to 10*d.* per ℔., according to quality.

CITRIC ACID, KOLA, LIME OIL, LIME JUICE, AND CASHEW NUTS.

At the beginning of the month citric acid was in good supply at 2*s.* $6\frac{1}{2}d.$ per ℔., in casks of 5 cwt. each. At the close of the month 2*s.* 7*d.* was being asked. At the first auction kola was in good supply, 88 packages being offered, but none disposed of. It was stated, however, that $3\frac{3}{4}d.$ per ℔. was asked for good bright. Later in the month, namely on the 16th, 4 barrels were disposed of at $1\frac{1}{2}d.$ to $1\frac{3}{4}d.$ per ℔. for dried nuts. West Indian lime oil has been in good supply; 26 packages were offered at the first auction, but no sales made: 3*s.* 3*d.* was the price asked for West Indian distilled, and 8*s.* to 8*s.* 6*d.* for hand pressed. For good bright raw West Indian lime juice there has been a steady demand at from 2*s.* 6*d.* to 2*s.* 9*d.* per gallon. At auction on the 17th, 22 cases of cashew nuts were offered, the whole of which were bought in at 40*s.* per cwt.

It is stated in the *Annual Report* on the Botanic Station, British Honduras, 1913, that seeds from an edible bean from Guatemala were presented to the Station a couple of years ago by Mr. J. R. Boatman. These were sown, and a few plants raised and planted. One of the trees has grown up well and borne a number of large pods. The edible part of this bean is the thick white arilus covering the bean inside the pod; the plant is evidently one of the Ingas (*Inga spectabilis?*), which according to the *Treasury of Botany*, is a tree indigenous to Central America. It grows in Panama, and there the seed inside the pods, covered with a sweet white pulp, is eagerly eaten. The Inga makes a fine spreading shade tree, giving plenty of sweet-smelling white flowers twice a year.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, January 26, 1914.

ARROWROOT—1¾*d.* to 4¾*d.*
BALATA—Sheet, 2/1; block, 1/10½ per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 69/- to 71/- per cwt.; Grenada, 60/ to 68/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £25 to £25 10*s.* per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 13*d.* to 13½*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 2/3 to 2/9; concentrated, £25 10*s.*; Otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations.
MACE—7*d.* to 2/11*d.*
NUTMEGS—No quotations.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 2/6; fine soft, 2/4; Castilloa, 1/10.
RUM—Jamaica, no quotations.

New York.—Messrs. GILLESPIE BROS., & Co., July 24, 1914.

CACAO—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11⅞c.; Jamaica, 10c. to 11c.
COCO-NUTS—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
COFFEE—Jamaica, 9¾c. to 13½c. per lb.
GINGER—7½c. to 10c. per lb.
GOAT SKINS—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $2·50.
LIMES.—$3·75 to $4·50.
MACE—45c. to 53c. per lb.
NUTMEGS—110's, 11¾c.
ORANGES—Jamaica, $2·00 to $2·50.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., February 8, 1915.

CACAO—Venezuelan, $16·00 to $16·25; Trinidad, $15·75 to $16·25.
COCO-NUT OIL—95c. per Imperial gallon.
COFFEE—Venezuelan, 11c. per lb.
COPRA—$4·00 to $4·25 per 100 lb.
DHAL—No quotations.
ONIONS—$4·00 per 100 lb.
PEAS, SPLIT—$8·50 per bag.
POTATOES—English $1·95 per 100 lb.
RICE—Yellow, $6·25; White $5·75 to $6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd. December 31, 1914, Messrs. T. S. GARRAWAY & Co., February 8, 1915.

ARROWROOT—$4·00 to $4·50 per 100 lb.
CACAO—$13·00 per 100 lb.
COCO-NUTS—$16·80.
HAY—$1·75 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$8·00 per 190 lb.
PEAS, SPLIT—$9·50; Canada, no quotations.
POTATOES—Nova Scotia, $3·25 per 160 lb.
RICE—Ballam, $6·10 to $6·35 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·00 per 100 lb.

British Guiana. Messrs. WIETING & RICHTER, February 6, 1915; Messrs. SANDBACH, PARKER & Co., February 5, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	14c. per lb.	14c. per lb.
CASSAVA—	$1·08	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$10 to $15 per M.	$18 per M.
COFFEE—Creole	——	16c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	16c. per lb.
Liberian	10c. per lb.	11c. per lb.
DHAL—	——	$6·15 to $6·25 per bag of 168 lb.
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	——
PEAS—Split	——	$11·50 to $12·00 per bag. (210 lb.)
Marseilles	——	——
PLANTAINS—	16c. to 40c.	——
POTATOES—Nova Scotia	$2·25 to $2·40	$2·25 to $2·40
Lisbon	——	——
POTATOES—Sweet, B'bados	$2·16	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
TANNIAS—	$2·16	——
YAMS—White	——	——
Buck	$2·04	——
SUGAR—Dark crystals	$3·40	$3·40
Yellow	$4·00 to $4·10	$4·00
White	$5·10 to $5·25	——
Molasses	$2·90	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	——

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Introduction of Disease.

CITRUS CANKER will by now be a familiar term to most readers of this journal, since at least three articles have appeared on the subject in recent issues. The present discussion, however, unlike the others, does not concern the study and control of the disease, but rather the grave lesson afforded by its widespread occurrence in the United States. Citrus canker is present in all the Gulf States, and was introduced from Japan probably within the last five years. Florida appears to have been the latest State to become infected, and here, in a country where citrus cultivation is a major industry, the rapid spread of the disease has produced a sensation and called for efforts of eradication almost unparalleled in the history of plant pathology. Fearing re-infection from abroad, the United States Government has absolutely prohibited the importation of citrus stock into any part of the country. Meanwhile the work of eradication continues. This work, strenuous and expensive, is being vigorously undertaken by the growers themselves, in co-operation with the officials of the Department of Agriculture.

The causative fungus was introduced originally, it is believed, on stocks of *Citrus trifoliata* from Japan. This species is fairly resistant to the disease, but is easily capable of carrying it. Once in the United States, the infection spread from *C. trifoliata* to allied plants like the grapefruit and orange, which proved to be highly susceptible. To a less extent it attacked limes and lemons. These facts illustrate the danger not only of introducing plants of a particular species in cultivation, but the even greater danger of introducing allied plants. The latter, like *C. trifoliata*, may be capable of effective resistance to a disease occurring in their native country; but species in the country into which the allied plants are introduced, which have not been exposed to the disease, may prove to be extremely susceptible. The history of disease affords several instances of this. The American gooseberry, for example, is resistant to mildew. But when these hardy stocks were introduced into Europe, they brought infection with them, which led to a widespread epidemic amongst the less hardy European gooseberry—a catastrophe which has necessitated the expenditure

of much energy and money, as well as the introduction of legislation to attempt, with dubious success, to keep the disease under reasonable control.

Another case is afforded by Phylloxera, the well-known pest of the grape vine. This was introduced into Europe from America on hardy vines, and made it necessary to replace the European stocks with resistant American ones. Still another instance is afforded by the Chestnut bark disease in North America. This came to the States from China on an exotic species of this tree. At the present time the disease is spreading through the northern forests of native trees like a pestilence.

Parallel to these cases are certain infectious diseases of man, which when introduced amongst a population not previously exposed to them, have broken out with appalling rapidity and effect. One has only to mention in this connexion, smallpox among the North American Indians, and syphilis amongst the South Sea Islanders. Jews, as a class are, from their squalid conditions of life for many generations, remarkably resistant to tuberculosis and other diseases. They are nonetheless very dangerous immigrants from the point of view of introducing disease.

Turning to another aspect of introduced diseases brought out by the case of Citrus canker, namely, the present system of plant inspection, we see clearly how futile this work is likely to prove in many instances. In the case under consideration, the resemblance of canker to scab deceived for some months the plant pathologists of Florida. Unknown diseases easily get past. For one reason, the inspector may have only a few minutes to decide. Then again, when a disease is known and looked for, it may be present in the form of spores, dormant mycelium, or in the 'incubation' stage. It is thus impossible to detect with certainty even known diseases. Certainly the only sure way is absolute exclusion of plants allied to those it is wished to protect, i.e., the important commercial plants. Where it is desirable to introduce new varieties or species, that work should be done either officially, or under a license involving quarantine and periodic inspection. This should form a function of every Experiment Station, which should contain an area of land reserved for growing introduced plants under technical observation. But all such work, however careful, must contain an element of risk. Finally it must be borne in mind that it is important to watch seed introductions as well as any others.

The danger of introducing diseases in the way described in this article should now be evident. It is largely a question of relative susceptibility. In a general way, modern systems of cultivation place plants under extremely artificial conditions, and in the long run cultivated species tend to become more and more susceptible to introduced parasites. The three examples given earlier in this article show how real the danger is. Our acquaintance with these cases has not been the result of the activity of a scientific crank anxious to find something for microscopic examination; we know of these painful cases because they have hit the practical man hard in his tenderest spot.

SUGAR INDUSTRY.

MANUFACTURE OF CONCRETE SUGAR.

At the West Indian Agricultural Conference in 1902, a paper was read by Dr. Francis Watts on raw sugars for brewing purposes (published in the *West Indian Bulletin*, Vol. III). In this, reference was made to the export of undrained massecuite in the form of concrete. The following notes, taken from the *Louisiana Planter* (January 2, 1915), show that the question is receiving some attention at the present time in Cuba:—

A few days ago Doctor Cuadrado of the local Sugar School—also Director of the Fabrication at Ingenio El Pilar—read a very interesting paper before the Academy of Science of Havana. His subject was 'Can Cuban Sugar Capture the English Market?', and he dealt with the question in a way that is new—or at least in a way that has not been considered seriously since the advent of centrifugals for separating the crystals from the molasses as they come from pan or crystallizer

He briefly describes a modification of a vacuum pan or 'concretor' that is manufactured on the island, and explains that its arrangement is such that a very effective circulation of concentrated massecuites may be obtained, thus permitting the turning out of a product that will contain less than 5 per cent. of water. Analyses of this massecuite or concrete are given, together with data regarding its keeping qualities, which were found to be excellent.

The Doctor believes that it would be entirely feasible to ship this concrete in sacks, and that it would be easily sold to the English refiners, who would be able to obtain therefrom either standard granulated sugars (by purging and remelting), or crystals very similar to those now brought from Demerara (this grade of product to be obtained by washing in the centrifugals), besides a superior quality of liquid product similar to the treacle and golden syrups, and that any molasses not turned into a directly edible product could be fermented and distilled.

The proposal certainly sounds interesting; probably more than usually interesting, because Doctor Cuadrado is among those who have in the past put forth their efforts toward raising the quality of the product of the local factories. But

it is not to be understood from the paper referred to that the Doctor's opinions in regard to the manufacture of direct consumption sugars have changed, but rather that he is presenting what seems to him a method for finding an outlet for the greatly increased production of which Cuba is capable, and which will undoubtedly be a reality before many more crops have been ground.

LIVE STOCK NOTES.

INTERNATIONAL CONGRESS PAPERS ON ANIMAL FOODSTUFFS.

The following abstracts, dealing with animal feeding in the Tropics, are reproduced from the *Proceedings of the Third International Congress of Tropical Agriculture, 1914.* Abstracts of a considerable number of the other papers read on different subjects have already appeared in the *Agricultural News*:—

Conservation of Ensilage in Warm Climates (abridged title). By Professor Giglioli.

The author draws attention to the special importance of ensilage in warm climates. By this practice green crops and herbage, and other green vegetable products can be gathered during the rainy season and preserved as succulent forage for the dry and hot months. Forage stored in silos is inevitably liable to great and variable losses of dry substance, and these losses in the nutritive value of the forage are naturally greater in warm climates. Hence the need in these, more than in temperate climates, of artificially assisting the preservation of ensilage, either by bacteriological or chemical means. Several methods, already applied or produced, are passed in review: steaming, inoculation with lactic ferments, addition of molasses, treatment with carbon disulphide, or with sulphur dioxide, treatment with mineral acid, especially with hydrochloric acid.

Preference is given to chemical methods rather than to inoculations with lactic ferments. New suggestions are made with regard to ensilage treated with molasses.

The need of new experiments is urged in regard to treatment with carbon disulphide, with carbon tetrachloride, and with sulphur dioxide.

A historical summary is given of the experiments on the treatment of ensilage with acids or acid salts. Special attention is called to the need of new experiments in the application of hydrochloric acid to ensilage.

A bibliography is appended.

Use of Manioc Flour in the Feeding of Milch Cows. By J. E. Lucas.

Concentrated foods have considerably increased in price in recent years. It is therefore of interest to endeavour by every means to supply for animals a feeding stuff as nutritious but much less costly, by utilizing every new product which our Colonial crops are able to furnish.

The substitution of a mixture of manioc flour (60 per cent.) and ground nut cake (40 per cent.) has rendered it possible to replace an equal weight of maize gluten cake.

The experiment, which has been made with two lots of cows, one of which was kept as a check, has enabled the efficacy of this substitution to be demonstrated. At the time of the experiment a saving of 4·25 per 100 kilogrammes of material employed was effected.

This would represent a saving of 3,000 francs a year for a herd of 100 cows.

Ground Nut Cake in the Diet of The Horse. By J. E. Lucas.

Fodder being very dear in Paris, the author has attempted to substitute for it a different feeding stuff.

He has utilized for the purpose straw, peat mixed with molasses, and ground nut cake. He thus obtains a feeding stuff containing the same elements as hay, and has been able to maintain, in perfect condition for ten years, a stable of twenty-five horses.

The experiment, which was made on test groups, has enabled it to be established that an addition to the ration of 0·700 kilogrammes of ground nut cake is sufficient for horses of 700 kilogrammes.

The author believes that good results are obtained by giving about 1 gramme of ground nut cake per kilogramme per day.

HOOKWORM, OR NODULAR DISEASE IN SHEEP.

This affection of the sheep's stomach and intestines was discussed in the *Agricultural News* for May 10, 1913. In view of cases having recently occurred in Trinidad, it may be well to give a recapitulation of the causes, symptoms, and preventive measures, especially since the disease in Dominica, in St. Lucia and St. Vincent, and in Trinidad, exhibits, in some respects, rather different characteristics.

The popular names, and the causative hookworms may best be expressed in tabular form, as follows:—

Colony.	Popular name.	Causative organism.	Remarks.
Trinidad	Nodular disease	*Oesophagostomum columbianum*	Nodules in the intestines.
St. Vincent, St. Lucia	Nodular disease; 'mumps'	*O. columbianum*	Nodules in the intestines.
Dominica	'La gomme'	*O. venulosum*	Dropsical swellings of the throat; No nodules.

The general appearance of an affected animal is characterized by pronounced anæmia and weakness. The abdomen is pendulous.

Prevention measures recommended are:—

(1) Drainage of pastures; application of salt and temper lime.

(2) Drinking ponds protected from infestation; better still, substitution of troughs.

(3) Provision of rock salt for animals to lick.

(4) Destruction of intestinal contents of slaughtered animals.

(5) Provision of nutritious food.

Owners of stock will understand, that the eggs of the worm (which is about $\frac{1}{2}$-inch in length) are expelled in the fæces, and *in the presence of moisture* these eggs develop into embryo, which are ingested into *healthy sheep* along with food and water. The importance of recommendations Nos. 1 and 2 will therefore be apparent.

FRUIT AND FRUIT TREES.

NOTES ON EXPERIMENTAL DRYING OF BANANAS.

The following notes on experimental drying of bananas, carried out by Mr. L. A. Brunton, Agricultural Inspector, Trinidad, are taken from the *Bulletin of the Department of Agriculture*, Trinidad and Tobago, November-December 1914:—

The figs for this experiment were not all equally 'full' or mature, and in consequence, ripened very irregularly, the most mature ripening in three to four days, whilst the least mature took eleven days.

The first lot was put out to dry on September 13, drying being completed by the 21st, a period of nine days; there was, however, very little sun on the first day, as it rained almost continuously, and only a half-day's sun on the 17th.

The remainder were put out in two lots on September 18 and 19, respectively, and were ready for packing by the 25th. Two days during this period were rainy with very little sun. It is therefore evident, that in favourable weather, drying can be accomplished in from five to six days.

The procedure adopted was as follows: when the bunches were brought in from the field, they were divided in hands, packed in a heap in the store-room on a bedding of banana leaves, and covered with dry grass.

When ripe, the figs were separated from the hands and peeled, care being taken to remove the 'strings' below the thick skin; they were then placed in rows on the drying floor of the cacao house, exposed to the sun, and turned continually during the day; at night they were heaped up and covered with dry banana leaves, but this was only done to the last lot from the third to the sixth day; it appears to assist the drying.

If a sufficient quantity of bananas were treated, the cost should not, I think, exceed 2*s.* to 3*s.* per 100.

CULTIVATION OF LIMES IN ST. VINCENT.

The following note, dealing with lime cultivation in St. Vincent, appeared in the St. Vincent *Sentry* for January 29, 1915:—

On Wednesday last Mr. W. N. Sands, Agricultural Superintendent, returned from an official visit to Bequia. He has been discussing the prospects of minor industries with the landowners of that district. Limes are considered a suitable product to be promoted there. Already a few acres have been planted and the trees are growing nicely. Mr. Sands also advises that larger areas be devoted to corn, peas, and such other produce that obtain ready market in the neighbouring islands, it being inadvisable to place undivided attention on cotton to the neglect of those products for which the soil in Bequia is peculiarly adapted.

Touching the matter of lime cultivation, we note with much satisfaction the progress which is marking the efforts of Dr. O. Teodorini on his lime plantation at Byahaut, in the Leeward District. Eighteen months ago, this gentleman, impressed with the fertility of the land in St. Vincent, and the prospects of the lime industry, acquired 50 acres, and at once set about cultivation on modern principles. He obtained the best quality of lime plants from St. Lucia. Besides planting a part of the area he decided upon, and on which the lime trees are growing splendidly, he has established a nursery of some 10,000 plants. In addition to this, Dr. O. Teodorini has an experimental plot of onions upon which industry he may devote some attention if he finds it feasible to do so. We notice these efforts as being very commendable in these times when new industries are looked for to lessen the depression caused by the glutted arrowroot market, and the slow sales of cotton—the two products upon which the proprietors, with hardly any exception, have hitherto thrown all their dependence. We congratulate Dr. Teodorini on his enterprise, and wish him every possible measure of success.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. The Superintendent of Agriculture (Mr. J. Moore) forwards a report on the work conducted by the Department during January. In this it is stated that work in the Experiment Station has included the harvesting of provision crops, and the re-organization of the corn selection experiments. In the Botanic Garden, routine work has been carried on, and land has been prepared for nursery beds into which 25,000 lime seedlings have already been transplanted. The Superintendent made several visits in connexion with the Land Settlement Scheme; several estates were visited also, as well as the greater portion of Carriacou. Very heavy rainfall was experienced during the first four days in January, and some good showers were received during the third week. The weather was very dry during the rest of the month. On the whole, the weather was more seasonable than during January 1914.

ST. VINCENT. It is stated by the Agricultural Superintendent (Mr. W. N. Sands), in his report for January, that in the Experiment Station cotton picking is now concluded. The old stalks have been burnt, and Bengal beans sown in the plots. During the month 15,400 cane cuttings were distributed, indicating the increased attention that is being given to the cultivation of sugar-cane. It is noteworthy that 12 acres of limes have been planted out at Bequia. The extension of coco-nut cultivation was continued. It is estimated that about 1,000 acres have been planted in the Colony within the last few years. As regards cotton, it is stated that this crop turned out badly through excess of rain in November and December. An interesting event has been the despatch of 3 bags (20 lb. each) of pedigree Sea Island cotton to the Fine Cotton Spinners' Association for spinning tests. In connexion with this, the reader should refer to an interesting paper which is appearing in the forthcoming issue of the *West Indian Bulletin*. During the month, the island was visited by the Imperial Commissioner of Agriculture, and Mr. J. L. Fonda, representing the Fine Spinners' Association, for the object of discussing with the local growers the cultivation of cotton in St. Vincent and the market situation. Attention is being given in this Colony to an extension of the area under maize, peas, and beans. The rainfall during the month was fair and seasonable.

ST. LUCIA. The Agricultural Superintendent (Mr. A. J. Brooks) notifies this Office that considerable attention was given in the Experiment Station during January to the sowing of lime seeds, and the distribution of lime plants. Considerable forestry work was undertaken: 200 juniper and 250 mahogany plants were established, and large batches of Casuarina were raised. In the Botanic Garden an effort is

being made to bring about the much needed improvement of elevating the lawns above sea-level. Reporting on the condition of the staple crops, it is stated that the cacao crop slackened off somewhat during the month. The coming lime crop was flowering, and the last crop still coming in. Further clearings were being made in the island for planting. An extension of the sugar-cane cultivation continues. During the month, the Superintendent began the examination of the elementary schools in agriculture. The rainfall at the Botanic Station was 4·31 inches.

DOMINICA. The 1914 lime crop, according to the Curator of the Botanic Gardens (Mr. Joseph Jones), has been decidedly below the average. Although cable quotations indicate a steady decline in the price of concentrated juice, the local prices continue high for raw juice and yellow limes. Special work in connexion with the lime crop by the Department has included an investigation into the losses occurring in the process of manufacturing citrate of lime. In the Lime Experiment Station, work included cutlassing and circling round young trees and the picking of limes. In the nurseries, land was prepared for limes, and cacao transplanted in the boxes. Coming events of interest include the tapping of Castilloa trees, and the clearing of land for citrus plots in the valley. During the month 950 lime plants were distributed. The rainfall for the month was 1·76 inches.

MONTSERRAT. The Curator of the Experiment Station (Mr. W. Robson) reports that the cultivation of maize is being undertaken upon a somewhat extensive scale; on one series of estates about 90 acres being planted. A disease new to Montserrat has recently been observed on maize. This has been diagnosed by the Mycologist of the Imperial Department as *Puccinia maydis* (brown rust). There was a keen demand for the newer varieties of sugar-cane growing at Grove Station. During the month 12,000 bay seedlings were planted in the beds. As regards cotton, very little was picked in January, and the crop is now finished. Samples of lint have been submitted to the Fine Spinners' Association for spinning tests. Fourteen other samples have been sent to the British Cotton Growing Association for report and valuation. Samples of distilled bay oil have been forwarded for examination to the Government Laboratory at Antigua. Consideration is being given with regard to a fresh series of cotton manurial experiments for 1915. The month of January was drier than usual, the rainfall at Grove Station being 3·42 inches.

ANTIGUA. According to the report of the Curator (Mr. Jackson), a great deal of the work of the Department in this island during January was connected with the sugar-cane experiments. But as well, large numbers of onion plants and coco-nuts were distributed among the estates. In connexion with the occurrence of pests, cotton caterpillars were fairly common, thrips were found attacking onions when maturing, and isolated instances were seen of Ustilago on maize. Several meetings were held during the month, including that of Directors of the Cotton Factory Company, and the Onion Growers' Association. The island was visited during the month by Mr. Fonda, referred to before on this page. The results of the last examination in Practical Agriculture were received. Of the two candidates that sat in Antigua, one obtained the second class certificate. During the month of January the weather was dry. The rainfall was only 1·61 inches.

ST. KITTS. The Basseterre Central Factory began grinding on January 19. The Agricultural Superintendent (Mr. F. R. Shepherd) states that the results were as satisfactory as could be expected, considering that the canes were not fully ripe owing to the desire to begin reaping at the earliest possible moment. Canes were being brought by boat from some estates on the western side, the price now paid making this practicable. The young cane crop was healthy and growing well, owing to the favourable showery weather. A larger acreage has been put in under the seedling varieties in the Basseterre district, as these are more suited to factory conditions than White Transparent. During the month the Assistant Chemist (Mr. Waterland) arrived, and started work in the Laboratory. The Veterinary Surgeon has also taken up his duties. The old cotton crop is now off, but a large portion of the lint has not yet been shipped, as growers are waiting developments with regard to prices. In this island increased attention is being given to the cultivation of provision crops, including maize. A report on the cultivation of this latter crop was read before the Agricultural Society, at a meeting on January 5. The rainfall for the month was 2·34 inches.

NEVIS. The Agricultural Instructor (Mr. W. Howell) calls attention in his report to the results of the experimental plots of yams, sweet potatoes, Guinea corn, etc. Mezzagua Guinea corn gave satisfactory yields. The experimental Indian corn, planted in the demonstration plot, is very promising. The following plants, etc., were distributed from the Station during the month: Sweet potato cuttings, 7,800; cassava cuttings, 750; Guinea corn, 131 lb. The cane crop throughout the island is green and very promising, and the fields have nearly all made a good stand. In some places the preparation of the soil has been very poor, and in far too many cases no manure has been applied, and poor plants employed. The old crop is being reaped on several estates, and most of the canes are being sold to the St. Kitts Factory. As regards cotton, the second growth in many fields has been badly damaged by worms, and from these fields the second picking amounted to very little; but in other fields, chiefly those to the windward part of the island, the second picking was very good, and in some fields it was quite as good as the first crop. Mildew occurred in many of the cotton fields during the month. The coco-nut groves at Pinneys estate were visited. During the month, 27,000 nuts were shipped, 2,000 of which were for planting purposes, and 25,000 for the New York market. A meeting of a special committee of planters was held on January 15, at which Dr. Tempany's address was discussed, and it was decided to approach the Government asking for financial aid in the erection of a Corn Factory similar to the one now working at Antigua, as the committee are of the opinion that such a factory, erected in Nevis, would be of very great benefit to the island. The rainfall for the month was 4·40 inches.

Attached to Mr. Moore's report from Grenada is the following table:—

EXPORTS FROM GRENADA DURING 1913 AND 1914.

	1913.	1914.
Cacao: cwt.	101,043	98,917
,, value	£225,317	£270,876
Cotton: cwt.	3,395	3,197
,, value	£ 9,019	£ 8,805
Cotton seed: cwt.	9,567	9,148
,, ,, value	£ 1,964	£ 3,907
Spices: cwt.	19,008	14,212
,, value	£ 36,899	£ 35,384
Coco-nuts: No.	24,430	116,780
,, value	£ 59	£ 414

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 8, with reference to the sales of West Indian Sea Island cotton:—

Since our last report West Indian Sea Island cotton has been neglected, and the only sale reported has been 6 bales St. Kitts at 15*d*.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended February 6, is as follows:—

There was a good demand for the offerings of odd bags on a basis of quotations, the buying being general, but principally for the Northern and Southern Mills, who were induced to buy Fine Islands, being relatively cheaper than Georgias and Floridas, which had advanced 1c. to 2c. during the week. This market being still relatively cheaper, the outlook is that the demand for the odd bags will continue.

There has also been some more inquiry for the crop lots for export, but as the offers were about 2c. below the views of the Factors, the only sale reported was 55 bales Bijou at 25c.

We quote, viz:—

Extra Fine	23c. = 14*d*.,	c.i.f. & 5 per cent.
Fully Fine	22c. = 13½*d*.,	,, ,, ,, ,,
Fine	20c. = 12½*d*.	,, ,, ,, ,,
Fine off in colour	18c. = 11½*d*.	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester, and Havre, up to February 6, 1915, were 50, 1,233, and nil bales, respectively.

BRITISH COTTON GROWING ASSOCIATION.

A report on the meeting of the above Association on January 5, 1915, has been received, containing several interesting items concerning the sale of African cotton.

It was mentioned at the meeting that the present buying price of cotton in Lagos, which has been maintained for some years, is 1⅛*d*. per lb. of seed-cotton; the Association have paid in addition a buying commission of ⅛*d*. per lb. to the merchants, who buy the cotton chiefly in small parcels at a time, and are put to considerable expense in the upkeep of the buying stations and storing the cotton. This is equal to about 6½*d*. per lb. for the lint cotton delivered in Liverpool, and owing to the serious fall in the price of cotton it has been found necessary to reduce the buying price. It is proposed that the buying price at all stations along the Lagos Kano Railway should be fixed at ¾*d*. per lb. of seed-cotton, and the Government Railway and the Steamship Company have been requested to reduce the freight charges by 25 per cent., and the merchants to reduce their buying commission by 25 per cent. Under the circumstances, the merchants have very generously agreed to reduce the buying commission by 50 per cent., and it was resolved that the most grateful thanks of the Council be tendered to them for the broad-minded and national spirit they have shown in this connexion. The Government have also generously agreed to reduce the freight on the Lagos-Kano Railway by 25 per cent., and it is hoped that a reply will shortly be received from the Steamship Company. It was mentioned that, even if the Association's proposals were accepted, it would still leave a loss on the cotton buying on the basis of present prices, which would be borne by the Association.

AMENDMENT OF THE COTTON TRAFFIC ORDINANCE, ST. KITTS-NEVIS.

His Honour the acting Administrator, St. Kitts-Nevis, has forwarded for the information of this Office, a copy of an Ordinance amending the St. Kitts-Nevis Cotton Traffic Ordinance, 1913, with regard to the marking of bales of cotton ginned in that Presidency. The following is a summary of the provisions of the Act.

In addition to the particulars of Section 24 of the principal Ordinance, it is provided the Ginners' Record shall show in clear and legible handwriting the name of the island where the cotton is grown, and if grown in different islands, the names of such islands, and the weight of cotton grown in each.

Upon the completion of the ginning and baling, the owner of the ginnery or person in charge shall cause each bale to be marked in legible letters 'Grown in St. Kitts', 'Grown in Nevis', 'Grown in Anguilla', according to the island. All cotton not grown exclusively in the Presidency shall be marked 'Mixed Growth' or 'Foreign Growth', as the case may be.

The person in charge of a ginnery is under no obligation to mark any bale until he is perfectly satisfied that the cotton is really the growth of the place from which it is represented to have come.

Any person representing any cotton to have been grown in any place other than the island wherein the cotton has actually been grown, and any person in charge of the ginnery wilfully marking any bale of ginned cotton falsely, or failing to mark each bale in accordance with the provision in the third paragraph above, shall be guilty of an offence, and liable to a penalty not exceeding £50.

DEPARTMENT NEWS.

Messrs. H. A. Ballou, M.Sc., Entomologist, and W. Nowell, D.I.C., Mycologist, on the staff of the Imperial Department of Agriculture, left Barbados on February 24 by the C.R.M.S. 'Chignecto', on an official visit to Grenada in connexion with matters relating to pests and diseases. They are expected to return to Barbados on or about March 10.

ST. VINCENT: REPORT ON THE AGRICULTURAL DEPARTMENT, 1913-14.

This publication commences with an account of the work carried on in the Botanic Gardens, and presents information in connexion with the nurseries and distribution of plants. During the period under review, a large number of sugar-cane cuttings and cacao plants were sent out, together with a quantity of mahogany seedlings which were supplied for the afforestation of Crown Lands. The section under review does not include the distribution of cotton seed, which is dealt with in those pages devoted to that crop.

The experimental work with cotton has included selection in relation to hybridization, resistance to disease, microscopic examination for fineness of lint, yield of 4-locked bolls, and the usual selection for public seed supply. All this work has led to interesting and, in many cases, important results. For instance, in connexion with the 4-locked bolls, it was found that the number of seeds from nineteen lots amounted to 183; the number from nineteen 4-locked came to 239. The yield of lint was correspondingly larger in the case of the 4-locked bolls.

Experiments have been started in connexion with the manuring of cotton and arrowroot. No conclusive results can be expected from the first year's trial; full benefit of this work will not be available until after the lapse of several years' trial.

Interesting results are recorded in connexion with the cultivation of crops on banks, compared with their cultivation on the flat. In the case of arrowroot, for example, it was found that the crop on a banked piece of land gave a poorer return than that grown in the usual way. The figures are as follows: banked land, 8,800 lb. rhizomes per acre; flat or unbanked land, 9,400 lb. rhizomes per acre. Results similar in principle were obtained in the case of cassava.

In connexion with this last named crop, a useful estimate is recorded in the report to show the relative value of dried cassava roots and cassava starch in relation to their exportation. Comparing prices of dried cassava roots and cassava starch, it is shown that when cassava starch is selling at over 3c. per lb. in Trinidad, or over $2\frac{1}{2}$c. per lb. in St. Vincent, it is more profitable to manufacture starch than to sell the dried roots.

Progress in the Colony's minor industries is shown to be satisfactory. As regards the chief industries, we may take cotton first. In the case of this crop, the irregular distribution of the season's rainfall affected harvesting adversely. The total value of the exports, therefore, showed some decline compared with those of the last two years. The figures are as follows: total value 1911-12, £44,104; 1912-13, £39,166; 1913-14, £37,127. For arrowroot and cassava starch, the recorded yields and values of exports are distinctly good. The figures are: 1911, and 1912, £1,300; 1913, £6,570.

A considerable number of observations were made during the year in connexion with pests and diseases and their control. Fairly successful efforts have been made to control the small bronze beetle (*Colapsis fastidiosa*), which attacks cotton seedlings on the Windward coast. A heavy dusting of lime through infected fields appears to do some good. The injury caused by thrips to cassava has also engaged the attention of the Department. Two new species have been discovered, and identified in England. A considerable number of insects were collected by the Superintendent and sent to the Imperial Department for identification. A list of these is given in the section under review.

The Assistant Agricultural Superintendent profitably occupied a part of his time by making a visit to the Grenadines with the object of coming to a decision as to whether these islands are generally or in part suitable for the cultivation of limes. His observations had regard principally to the presence or absence of insect and fungus pests, and the report will no doubt be read with interest by those who are locally familiar with the conditions in the Grenadines.

Appended to the Agricultural Report is one by the Government Veterinary Surgeon. In this it is stated that two cases of anthrax occurred during the year under review, in a locality favourable for the occurrence of this disease. This is the first record of anthrax in St. Vincent for some time. Prompt measures have been taken, by means of compulsory vaccination and other ways, to prevent further outbreak.

DIVI-DIVI—A SOURCE OF A VALUABLE DYE.

Divi-divi has often been referred to in these columns as a source of tannin. The commercial product consists of the pods of *Caesalpinia coriaria*, which is a native of the tropical regions of America, and occurs in West Africa.

The following note is taken from *The Board of Trade Journal* for December 24, 1914:—

The Board of Trade Committee for Chemicals and Dye Stuffs has received the following information from a reliable source: Divi-divi is a very useful dye extracted from the seed-pod of a small tree which grows wild in almost inexhaustible quantities over the arid regions of the Peninsula of Goajira. The product is collected by the native Indians, part being taken to Rio Hacha and part to Maracaibo in Venezuela, whence it has hitherto been taken in sailing ships to Curaçao and thence to Hamburg, which is the distributing centre for the rest of Europe. The bulk is disposed of in Russia.

Up to 1895, all the divi-divi was shipped to the United Kingdom, but the trade was then diverted to Germany, owing to the greater facilities offered by German commission houses, mainly in the direction of financial accommodation, and cheap warehousing.

Divi-divi is usually shipped loose, but it is not difficult to reduce the bulk by compressing it into bales; in this form the freight is reduced by about one-half, and the product also fetches a higher price.

In regard to the volume of business to be done, the following figures will be of interest. Official data from the Custom House at Rio Hacha give the export for the last five years as 2,075 tons in 1909, 3,895 tons in 1910, 5,997 tons in 1911, 1,246 tons in 1912, and 2,078 tons in 1913. The price varies between £8 and £10 per ton, and the freight between £1 18*s.* and £2 2*s.*

In addition to shipments from Rio Hacha, a very considerably amount finds its way to Curaçao direct from the Goajira coast-line by coasting steamers, and shipments are made from Maracaibo about equal in volume to those from Rio Hacha.

EDITORIAL NOTICES.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' should be addressed to the Agents, and not to the Department.

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Agricultural News

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NOTES AND COMMENTS.

The serious lesson afforded by the spread of Citrus canker in the United States is dealt with in the editorial to this issue.

Under Live Stock Notes, on page 67, will be found interesting abstracts concerning the feeding of animals in the Tropics, as well as a concise summary of our present knowledge of hookworm disease in sheep.

Extensive items of local interest appear on pages 68 and 69.

An important note on the St. Kitt's Cotton Traffic Ordinance will be found on page 70.

The report on the St. Vincent Agricultural Department, 1913-14, is reviewed on page 71.

Considerable interest and importance attach to the second Note and Comment in the next column on this page.

The Insect Notes in this issue, which will be found on page 74, deal with agricultural pests in Nigeria; Fungus Notes, on page 78, comprise a comprehensive account of the rusts and smuts of Indian corn.

The results of experiments in kiln-drying corn at Antigua will be found on page 75.

Three notes appear in this issue (pages 73, 75, and 77,) on the subject of sisal hemp production.

Rainfall in Dominica, 1914.

Copies of the rainfall returns in Dominica, for the year 1914, have been received from the Curator, Mr. Joseph Jones. These show that the mean precipitation for thirty-two stations for the year was 109·85 inches. Of these stations, eleven, situated on the leeward coast, show a mean return of 80·80 inches: three windward coast stations 115·48 inches; La Soye coast station 84·05 inches: whilst the mean return for twelve inland stations was 147·96 inches. The lowest precipitation, 49·89, occurred at Batalie; whilst the highest return was 252·86 inches of rain, which fell at Gleau Manioc.

Advancement of the West Indian Bay Oil Industry.

Mr. J. C. Umney, F.C.S., Editor of the *Perfumery and Essential Oil Record*, publishes a lengthy article in that journal for December 1914, on the Bay oil industry of the West Indies. Information concerning this developing cultivation was brought to Mr. Umney's notice by the Imperial Commissioner of Agriculture, who forwarded copies of the Botanic Station Reports, Montserrat, and other literature on the subject issued by this Department, as well as samples of the oil itself.

The following passage is reproduced from the article in question:—

'We have always felt that this oil of the eugenol-containing group has not enjoyed the popularity that its sweetness and delicacy of aroma deserves, for obviously its money value has no ratio to its phenol-content, as it contains the lowest percentage of the group and commands the highest price. There is little question that the sophistication of the oil by dealers with eugenol from other sources, or eugenol-containing oils, has to a large extent "spoilt its market". Let the natural distillate be sold, as now suggested, under Government certificate as the natural product of *Pimento* or *Myrcia acris*, and with a phenol-content of 55 to 65 per cent. (which, as the report which follows shows, is easily attainable by judicious bulking of a season's distillates,) and the price commanded will be profitable, and the oil will find its correct market position. What ratio in price is there between otto of rose and citronella oil? No more than there is between true bay oil and clove oil.'.

In the issue of the *Perfumery and Essential Oil Record* for January 1915, Mr. Umney reports on his analysis of the sample of Bay oil forwarded as stated above by the Imperial Commissioner. This sample was found to contain a rather lower phenol-content than the average, and points to the necessity for judicious bulking. Attention is called as well to the low specific gravity of this sample (·950). It is suggested that it might be well to adopt this figure as the lower limit in the range ·950 to ·990, in order to include the most fragrant oils, corresponding also with 55 per cent. and upward, of phenolic constituents.

Readers of the *Agricultural News* will regard with satisfaction the interest manifested by our contempory in this new industry of the Leeward Islands.

The Shape of Commercial Rubber.

The question of the physical shape of rubber to be packed is discussed in the *India-Rubber World* for January 1, 1915. The disadvantages of sheets, slabs, sausages, and pelles are pointed out. For instance, pelles or balls gather dirt and cannot be packed without waste; crêpe must be pulled apart, and a pound or two torn from one end is not missed. It would certainly seem desirable, therefore, to adopt a form of standard dimensions, and branded with the name of the plantation. Rubber in such form would be hard to steal, hard to dispose of when stolen, would pack without waste of space, and would be exceedingly easy to handle in weighing.

The Present Supply of Textile Fibres.

The subject of the present supply of textile fibres includes several important points worthy of consideration. In East Africa, the German supply ot some 60,000 tons annually of sisal hemp has been completely cut off. In the Philippines, the Abaca or Manila hemp industry has of late years shown a steady decline, which has just necessitated Government intervention. The jute output of India, as well as hemp from Russia and New Zealand, have all been affected adversely through the war. On the other hand, the future extension of wheat growing and consequent increased demand for binder-twine (for which sisal and Manila hemp are used) will tend to improve prices in the future.

In connexion with these matters, the following references may be given as likely to prove helpful to those readers who are interested in the subject:—

(1) Hemp and other Textile Fibres: *International Rubber, Cotton and Fibres Exhibition Handbook*. 1914;

(2) The Fibre Market: New Zealand *Journal of Agriculture*, September 1914, and after;

(3) Cultivation of Sisal Hemp in the West Indies: *Agricultural News*, April 25, 1914;

(4) Jute and Hemp: Section VI, *Proceedings of the Third International Congress of Tropical Agriculture* 1914;

(5) New Act for Compulsory Grading of Manila Hemp: *Philippine Agricultural Review* for October-December 1914;

(6) Sisal Industry in British East Africa: *Report on Department of Agriculture, B. E. A.*, 1912-13.

On another page in this issue will be found, in tabular form, a list of the chief fibre-producing countries and their exports; also practical details concerning the production of sisal hemp in British East Africa.

Success with sisal in Jamaica makes it possible that the near future may see an industry established in some of the smaller islands of the West Indies. In this connexion, it is well to bear in mind the favourable position of the West Indies as regards trade with the United States, a country in which exist the big monopolies for binder twine manufacture.

The Production of Thymol.

In the issue for January 13, 1915, *The Times* calls attention to the fact that hitherto the well-known antiseptic thymol has been manufactured in Germany, notwithstanding the fact that ajowan seeds, the sole source of commercial thymol, are grown in India.

The plant which produces ajowan seeds belongs to the Natural Order Umbelliferae, and is known as *Carum copticum*. The plant is cultivated from Bengal and the Punjab to the South Deccan. It appears that two products are obtained from the seed, but the 'Ornum water', which contains the thymol, is the more important.

Thymol is a better antiseptic than phenol (carbolic acid), being less irritant in its action on wounds. Thymol is also a useful medicine for the expulsion of intestinal parasites, being largely employed in cases of Ankylostomiasis.

Perhaps ajowan seed might be profitably cultivated as a minor industry in the West Indies; though, of course, the point in question at present is not one of production, but one of manufacture.

Influence of the Skill of the Tapper.

Interesting results of the experiments undertaken to determine the effect of influence of skill in rubber tapping, as shown in the quantity of rubber obtained from a given number of trees, are published in a recent number of the *India-Rubber World* (January 2, 1915). In the experiments, fifteen lines of trees were taken and fifteen coolies were chosen, all of whom were good tappers as far as one could judge: among the number there was not one who could be described as a bad tapper in any sense of the word, and all were tappers of long experience. On the first day each coolie tapped one of the fifteen lines of trees, and on every successive tapping day each coolie was moved along to the next row. Thus at the end of a period of fifteen tappings each coolie would have tapped the whole fifteen lines of trees once. The relative positions of the tappers in the field were changed periodically for the purpose of trying to determine whether the order in which one man followed another on the lines of trees had any influence upon the results. Following is the brief summary of conclusions arrived at:—

(1) With a gang of good tappers who all tap a number of tasks in rotation the same number of times under equal conditions, the difference between the weights of rubber brought in by any two coolies may amount to over 30 per cent.

(2) The gang may be arranged in order of merit after a number of periods, and the variation of this order in any one period is only slight.

(3) If the order of rotation in working be changed, the effect upon the order of merit is slight, the good tappers still remaining the best, and the worst tappers still coming at the bottom of the list.

(4) The deductions made from results of tapping experiments previously recorded may be considerably discounted on account of this factor of personal skill, which has been neglected hitherto.

INSECT NOTES.

AGRICULTURAL PESTS, NIGERIA.

An interesting report on the Agricultural Pests of the Southern Provinces, Nigeria, by W. A. Lamborn, M.B., is published in the December number of the *Bulletin of Entomological Research*, Vol. V, Part 3). The following is a brief review of this report, with special reference to those points which have application to West Indian conditions. The insects and mite pests are dealt with under crop headings, the three principal of these being cotton, cacao, and maize.

COTTON.

The pests named as attacking the leaf of the cotton plant, are a leaf miner, the larva of a small Tineid moth (*Acrocercops bifasciata*, Wlsm.), a small mite, probably a red spider of the genus Tetranychus, the cotton aphis (*Aphis gossypii*, Glov.), a short-horned grasshopper (*Zonocerus variegatus*, L.), the leaf roller (*Sylepta derogata*,F.), the larvae of the Limacod moth (*Parasa infuscata*, Wichg. , and of a Noctuid moth, as well as certain beetles, among them a Lagrid (*Lagria villosa*, F.), and an Eumolpid (*Syagrus calcaratus*, F.).

The leaf miner at times causes considerable damage by reducing the vitality of the plant.

The small mite or red spider is suspected of being instrumental in the spread of 'black arm', and of a pink Fusarium, but the point is not considered to be proved.

The cotton aphis were abundant in August but they were quickly and effectively checked by their natural enemies, among which were three lady-bird beetles, the larvae of three species of Syrphus flies, and the larvae of a lace wing. The lady-birds were *Chilomenes lunata*, F., *Chilomenes vicina*, Muls., and *Hyperaspis pumila*, Muls.; the Syrphid flies were *Syrphus nasutus*, Wied., *Paragus borbonicus*, Mcq., and *Paragus longiventris*, Bezzi; the lace wing was *Micromus timidus*, Hagen. By far the worst pest attacking the leaves of the cotton plant was the short-horned grasshopper, the nymphs of which appeared in immense swarms in November, and entirely defoliated many plants. Although cotton was the favourate food plant, these grasshoppers appeared to feed on many others, including wild bush plants, and cultivated crops such as maize, young Para rubber, cassava (in particular), cacao, bananas, and a variety of ornamental plants, especially Acalypha.

An attempt to control this insect was made by spraying with lead chromate, but it appeared to kill but few of them, serving more as a deterrent, which drove them to other plants. The leaf roller was abundant at one part of the season, particularly on certain imported varieties of cotton, chiefly American. This insect was somewhat held in check by Hymenopterous parasites, *Xanthopimpla punctata*, and others, and Tachinid flies, of perhaps two species. As this control was not effective, resort was had to hand picking by small native boys, who collected at the same time the various cotton stainers. The other insects attacking the cotton leaves were not responsible for much damage.

The insects which attack the cotton stem were two species of scale insects: *Hemichionaspis minor*, Maskell, and *Pulvinaria jacksoni*, Newstead; and a small green Buprestid beetle (*Pseudagrilus sophorae*, L.). The scale insects were not particularly abundant or injurious.

The larvae of the beetle caused considerable damage by boring into the stems of the plants. When young plants were attacked they became much distorted and deformed. They did not usually die but produced, later, imperfect, undersized bolls. Older plants, when attacked, became very sickly in appearance, often shedding their leaves. The larvae tunnelled and fed in the layers of young tender wood just beneath the bark until fully grown, when they penetrated into the pith, where they pupated. The adults emerged by boring their way out, the emerging holes being visible high up on the main stem or large branches.

The roots on the cotton plant were attacked by the larvae of a Lamellicorn beetle, and some injury was done by them. Carbon bisulphide was tried as a remedy with promising results. The plot of cotton attacked by these hard back grubs had been planted in cotton in the previous season, and it is thought that this accounted for the damage done; a rotation of crops might have been a better plan.

A considerable number of insects attacked the cotton bolls. Of these there are two boll worms which attack the immature lint and seed in unopened bolls, and two which confine their attacks to the seeds both in opened bolls, and in storage.

The two boll worms which attack the unopened bolls are the cotton boll worm (*Erias biplaga*, Walk.), and the red boll worm (*Diparopsis castanea*, Hmp.). These were of abundant occurrence, the former of them being controlled by a hymenopterous parasite.

In the case of the other two boll worms, *Pyroderces simplex*, Wlsm., and *Mometa zemiodes*, the larvae are small, bright pink caterpillars, which attack cotton seed in the open bolls in the fields, and in storage both before and after ginning, and they are also found in waste cotton scattered about the ginnery. The larvae of both these species are attacked by a Chalcid parasite (*Chalcis olethrius*, Waterston).

Four species of cotton stainers were observed, viz. *Dysdercus superstitiosus*, F., *D. nigro-fasciatus*, Stal., *D. melanoderes*, Karsch, and *Oxycarenus dudgeoni*, Dist.

Of these, only the first named was at all numerous. This species was found on a variety of food plants of which okra was the favourite. The insect fed in numbers on the nectar of *Urena lobata*, and was even observed on a dead and sun-dried lizard, and on sheep's excreta.

It is stated, as a fact of interest, that *D. superstitiosus* and *D. melanoderes* have been observed to interbreed.

Hand picking seems to be the most effective method of control for the cotton stainers.

CACAO.

The pests which are reported as attacking the cacao leaf were: a species of Psyllid (*Udamostigma tessmanni*, Aulm. var.), on the growing shoots of young plants; they were controlled by brushing with kerosene emulsion; Aphides, on the leaves and young pods, which were controlled by natural enemies; the grasshopper, already mentioned as a pest of cotton; a Rutelid beetle (*Adoretus hirtellus*, Castn.), which was the worst cacao pest. This insect feeds by night on young plants and hides by day. Next in importance as a pest of this crop is the Arctiid moth (*Diacrisia maculosa*, Cram.). Several other insects attack the leaves of cacao, but they are of minor importance. It is an interesting fact that the leaf-attacking pests of cacao are mostly to be found on young trees. The older trees are frequented by the red tree ant (*Oecophylla smaragdana longinoda*, Latr.), which is highly combative, and probably keeps off many pests, as these are not attacked; while the younger plants which are not frequented by this ant suffer, sometimes severely, from attacks of leaf-eating insects.

Paris green and lime, dusted on the leaves of the young trees, gave good results in the control of these insects, but as the Paris green showed a tendency to scorch the young leaves, lead chromate, as a spray, was afterwards used.

This article will be concluded in the next issue of the *Agricultural News*.

SISAL HEMP INDUSTRY IN BRITISH EAST AFRICA.

In the last issue of the *Agricultural News*, reference was made in the review of the *Annual Report* on the Department of Agriculture, British East Africa, 1912-13, to important information in connexion with the method and cost of producing sisal hemp in British East Africa. The following gives a detailed account of this, particularly in relation to the preparation of the fibre for market.

The capital required for planting 1,000 acres is approximately £3,000. The cost of machinery for the actual manufacture of the fibre is £4,500. The return expected is 1 ton per acre for three years from date of first cutting. The earliest time when a return may be expected is after four years from planting. The cost of production is about £10 per ton from the time the fibre leaves the plantation (including the cutting) to placing it on the London market, allowing £1 per ton for transport for the railway.

The following information refers to the Sisal Factory at Punda Milia:—

'The *power of working* the factory is supplied by a suction gas engine, No. 3, 120 of 75 h.p., and was obtained of "The Cundall Gas and Oil Engine Company", Keighley, England. If running for about ten hours the engine consumes about one-third of a ton of charcoal, which is made on the property from Acacia and other trees.

'*Decorticating Machine.*—This is a "New Corona" by Krupp, and when fully working cleans about 100,000 leaves per hour, the output of fibre during a spell of eight hours being about 2 tons.

'*Washing.*—Immediately after decortication the fibre is washed in water contained in concrete tanks adjoining the factory, and is then hung out on wires in the open close by, where, on bright days, it quickly dries, and is bleached as white as can be desired.

'*Beating and Cleaning Process.*—Various methods for freeing the dried fibre of pithy matter, dust, etc., have been tried at Punda Milia, but the best of all, and that now adopted, is a simple apparatus evolved, designed and fitted up by Mr. Rutherford, who, from the outset, has been associated with the Honourable Mr. T. R. Swift in establishing and developing the sisal estate under review. The apparatus referred to consists of two lengths of ordinary 3-inch piping, each firmly secured at either end to a central shaft, which revolves at a rapid rate, so that the fibre held in the hands of men, properly protected by a wooden screen, is beaten so briskly by the pipes that practically all impurities are removed; after one end of the fibre has been beaten it is reversed, and the other end similarly treated.

'*Baling.*—After being weighed, the thoroughly dried fibre is then placed in a "patent Bijoli Press" by Shirtliff Bros., Hampton Hill, Middlesex, England. The bales weigh 2 cwt. each, and are found a convenient weight and size for handling, and the trade mark on the baling cloth is a zebra or Punda Milia, from which the native name of the plantation is derived.

'About 1,000 acres are now established in sisal at Punda Milia, half of which area is maturing for cutting, whilst a further considerable acreage will be planted with *Agave sisalana* as fast as circumstances permit.

'Tram lines have been laid down in the older section of the plantation for the purpose of transporting the sisal leaves to the factory, but owing to the delay in delivering the trolleys or waggons ordered from England, the transport is at present mostly done by ox-carts.'

RESULT OF EXPERIMENTS IN KILN-DRYING CORN AT ANTIGUA.

Notice was given in the last issue of the *Agricultural News* of the arrangements recently made by the Government in regard to the commercial drying and storage of Indian corn in Antigua. The following is a part of Dr. H. A. Tempany's report of the experiments, the results of which were considered so favourably by the Government:—

In accordance with instructions given by His Excellency the Governor, experiments have been carried out to test the effect of kiln-drying locally grown corn.

On October 23, 1914, the following samples of corn were used for the purpose:

1. A 2-bushel bag of recently kiln-dried locally grown maize.
2. A 2-bushel bag of maize imported from New York.
3. A 2-bushel bag of locally grown maize, similar to 1, but which had *not* been kiln-dried.
4. A bag of locally grown maize, similar to 1, but on the cob.

The bags were put up in closed receptacles.

The conditions found, when the various experiments were opened (January 18), are summarized below.

No. 1. Locally grown kiln-dried maize. Quite cool and sweet; no signs of mould, no evidences of weevil attack, but a small amount of grain moth.

No. 2. Imported maize purchased from Benett Bryson Badly sweated and hot; quite a considerable growth of moulds, and heavily infested with weevils; no grain moth.

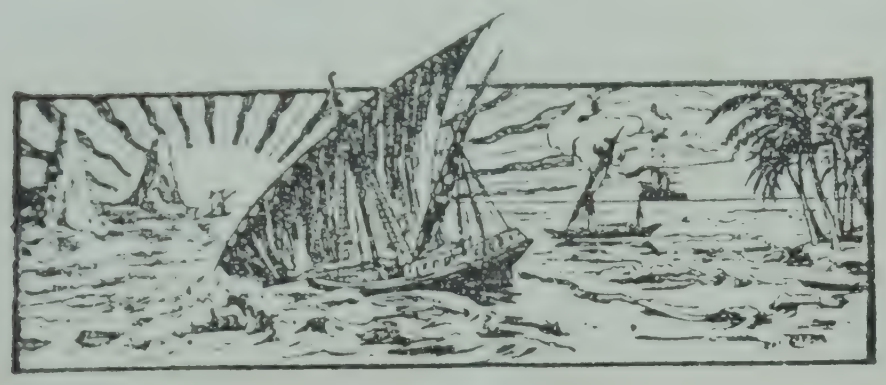
No. 3. Locally grown maize which had not been kiln-dried. Somewhat sweated and hot; some growth of moulds; very heavily infested with weevil and grain moth.

No. 4. Corn on the cob. Cool and not moulded to any appreciable extent, but very heavily infested with grain moth and weevil.

The results of this experiment are interesting and instructive, the point being that any insect or fungoid trouble which arose, must have been due to conditions in the corn at the inception of the experiment, and could not be due to infection from outside sources.

One may say that the results obtained can be regarded as definitely conclusive, and show quite clearly that if due regard is paid to conditions of storage, locally grown kiln-dried grain can be kept in good condition, and moderately free from insect attacks for considerable periods.

Deterioration of Lime Juice.—Raw lime juice when exposed to the air in open vats slowly deteriorates, principally by reason of the growth of mould on the surface, which splits up some of the citric acid into carbon dioxide and water. No toxic substance is produced, and the fungus is strictly aerobic, that is, it cannot develop in air-tight casks. If the essential oil, which is by nature a preservative, be removed from raw lime juice, the deterioration is much quicker. As much as 15 per cent. of acidity may be lost in two months under these conditions. It is never advisable to add chemical preservatives like salicylic acid or potassium bisulphite to raw lime juice.



GLEANINGS.

The rainfall at the Experiment Station, Tortola, Virgin Islands, during January, was 2·42 inches. The early part of the month was exceedingly dry, and retarded progress in all agricultural operations. The distribution of plants from the Station was affected to some extent.

In *Nature* for January 21, 1915, appears a review of Dr. H. H. Dixon's monograph on transpiration and the ascent of sap in plants. The substance of the book consists of a re-statement of the cohesion theory of the ascent of water. The so-called 'vital' theories are disproved.

The *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for October 1914 mentions that two agricultural schools are to be established in Panama. One of these will be located near New Gorgona. The Government is also contemplating the establishment of an agricultural experiment station.

It is stated in the *Planters' Chronicle* for December 25, 1914, that the world's total tea production during 1913 was 307,097,000 lb., of which Southern India contributed 22,245,000 lb. or 7·2 per cent. It is interesting to observe that the West Indies, with the exception of a small quantity from Jamaica, contribute nothing to the world's output of tea.

The important work of the Imperial Department of Agriculture for the West Indies is referred to in *Nature* for January 14, 1915. The note in question calls attention to the efforts that are being made to improve the cultivation of crops in the Virgin Islands, amongst other places. Mention is made of the Report of the Botanic Station in the Virgin Islands, 1913-14.

By means of electricity it has been found possible to destroy completely tubercle bacilli in milk. According to the *Journal of the Board of Agriculture* (England) for December 1914, the total bacterial count is greatly reduced (by about 99·93 per cent.); all *Bacillus coli* and its allies are destroyed; tubercle bacilli are also destroyed; no chemical change in the milk can be detected, and the taste is quite unaltered.

Panama hats are made of Toquilla straw derived from a species of stemless screw pines, the most important growing wild in the hot moist regions of Ecuador and Columbia, and also along the waters of the Amazon. The *Journal of the Royal Society of Arts* for January 15, 1915, says many attempts have been made to cultivate the plants but unsuccessfully, for it seems to be only in the wild state that the characteristic qualities are developed.

The flowering of the bamboo is always a periodical event of great interest. Reference is made in the *Gardeners' Chronicle* for January 23, 1915, to the flowering of *Bambusa polymorpha* in Burma, during 1914. The last outbreak of flowering, when all the plants burst into blossom, was in 1859-60. The seed then produced gave rise to the plants, which after fifty-four years of preparation, burst into flower simultaneously towards the end of last year.

Recent investigations into the possibilities of using species of Hedychium as a source of material for paper-making have made it particularly desirable that a clear understanding of the exact botanical positions of the plants experimented with should be obtained. As a result of this, a useful article appears in the *Kew Bulletin of Miscellaneous Information*, No. 10, 1914, entitled Hedychium coronarium and Allied Species. This key will no doubt be found very useful in the West Indies and Tropical America.

Attention is given in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for August 1914, to work conducted at Budapest in connexion with the importance of inorganic constituents in feeding stuffs. Pigs fed exclusively on maize excreted, in spite of putting on muscle, more calcium than they retained, and made up the difference with magnesium. This lack of calcium is liable to interfere with the proper development of bone. Where necessary, small quantities of calcium carbonate, or perhaps calcium phosphate might be added to the ration.

An account appears in the St. Vincent *Sentry* for February 5, of Mr. J. L. Fonda's address to the cotton growers of that island. At this meeting the chair was taken by Dr. Watts, C.M.G., Imperial Commissioner of Agriculture. The principal point raised by the growers was whether the Fine Spinners' Association would guarantee a minimum price based on the grade of cotton without necessarily involving a contract to make sale by the growers compulsory. It is understood that Mr. Fonda has promised to bring the matter before the notice of his principals.

The question of the supply of potash manure has for some months engaged the attention of the American Government. *The Board of Trade Journal* (January 14, 1915,) states that the most promising American source of potash is found to be the annual crop of giant kelp on the Pacific Coast. The area of the commercially available beds aggregates nearly 400 square miles, capable of yielding annually, either as dried kelp or as potassium chloride, over six times the present consumption of soluble potash salts in the United States, or something more than the world's present production. The development of a great potash-producing industry in the United States seems now to be a matter of time only.

An account appears in the Trinidad *Mirror* for January 27, 1915, of the proceedings at a meeting arranged to inspect the new cassava factory in Trinidad, and the cassava lands in that island specially cultivated by Sir Norman Lamont as a pioneering effort. It would appear that the factory works satisfactorily, with the exception that some difficulty has been experienced in connexion with the transport of cassava roots from distant points. As a remedy for this, it is suggested that central depôts should be established where the farmer can deposit his cassava, get paid for it, and the factory collect it as required. It is understood that the present factory is only of a temporary nature, and its capacity of using 30,000 tons of cassava will be increased, if people can be induced to plant still more land in this crop.

STUDENTS' CORNER.

Seasonal Notes.

Reference to the page in this issue dealing with Items of Local Interest will show that considerable attention is being given in several of the islands to the increased cultivation of maize. In Grenada the corn selection experiments have been re-started, and in St. Vincent, and particularly in Antigua, there is a very considerable extension of the area under this crop at the present time. In regard to selection of seed for planting maize, the student may be referred to the pamphlet recently issued by the Imperial Department entitled Indian Corn. Selection in corn cultivation is dealt with on pages 43-50. This information should be studied, and special attention should be given to the idea of producing a uniform plant well adapted in every respect to local conditions. For instance, it is not merely desirable to select for yield alone (though this will necessarily be a first consideration); it will be desirable to consider as well the habit of the plant in relation to the position of the ears, and the size and structure of the leaves, in relation to labour and climatic conditions, respectively. In this issue is published the results of the Antigua kiln-drying experiments. These are conclusive, and show that locally grown corn, after being dried, can be stored safely for a considerable period.

By the time this issue of the *Agricultural News* comes to hand, the grinding of cane will be in full swing. At the same time, the young crop just established will need attention, and it will be well to observe the prevalence of weeds, and investigate as far as possible the causes of any failures of the young plants that may be seen in the field.

Much interest is being shown in the West Indies in essential oils. Information appears in this issue in connexion with Bay oil, the production of which is a promising industry in the Leeward Islands. Another matter to which the student should give attention is the preservative action of essential oil of limes in raw lime juice. This matter will be found discussed on page 75.

Questions for Candidates.

PRELIMINARY.

1. How does milk of lime assist in clarifying cane juice. What is the result of using excess of lime?

2. Explain the function of lime in the manufacture of calcium citrate. What are the local sources of this lime and of the citrate radicle?

INTERMEDIATE.

1. Write a short account of the importance of scientific names in regard to plants, pests, and diseases. What is a synonym?

2. What are the important characters of a seedling cane?

FINAL.

1. What are the chief leguminous crops grown in your district as green dressings? Discuss the idea of growing beans and peas, both as green dressings and as food crops.

2. Write a short account of the production of essential oils in the West Indies.

West Indian botanists will be interested in an article entitled The Ecology and Anatomy of *Polygonatum commutatum*, L., which appears in the *American Midland Naturalist* for January 1915. The genus Polygonatum is represented in the West Indies, and is chiefly of interest owing to the remarkably slow growth of the species referred to.

PRODUCTION OF JUTE AND HEMP.

The following table shows the world's principal exporting countries, the cultivated plant which yields the fibre in each case, and, where figures are available, the exports in tons of fibre:—

Fibre.	Botanical name of plant.	Exports, 1912. Tons.
Indian Jute	*Conchorus* spp.	2,000,000
Russian hemp	*Cannabis sativa.*	50,140
Italian hemp	,,	44,600
Hungarian hemp	,,	
New Zealand hemp	*Phormium tenax*	
Manila hemp	*Musa textilis*	172,000
East Indian hemp	*Crotalaria juncea*	
Mauritius hemp	*Furcraea gigantea*	
Java hemp	*Agave cantala*	10,000
Sisal hemp—Mexican, etc.	*Agave rigida*, var. *elongata.*	849,698
German East African	,,	16,000
British East African	,,	
Bahamas, Florida	*Agave sisalana*	

It will be seen that a large number of different species of plants are employed in many different countries of varied climates. Each species is frequently represented by several varieties or strains. As well as the countries above-mentioned, it should be pointed out that several other places are beginning to establish a hemp industry, or at least attemping to; for example, Fiji, Jamaica, and Sicily. In this latter country a strain of *Agave sisalana* has been acclimatized.

A Triple Purpose Breed of Cattle.—In Switzerland there exists a triple purpose breed of cattle which is known as the Simental breed. The animals of this race are moderately good milkers, meat producers and workers, and it would seem, considering the conditions of employment of cattle in the West Indies, that these animals may be of some interest to local planters. Their characteristics are briefly described in the New Zealand *Journal of Agriculture* for November 20, 1914. We may confine ourselves in this note to the information given as regards the animals' capabilities. Cows of this breed, according to official figures, have given up to 6,078 kilos. (kilo = 2·2 lb.) of 3·94 per.cent. milk in twelve months. As regards rational fattening, the Simental breed gives very good results, in the quantity as well as in the quality of the meat. The flesh is said to be firm, with fine fibres, and well provided with fat. The best results are obtained with the oxen, the heifers, and the young calves; but even the milch cows from eight to ten years of age give, in general, good results. By reason of their build, constitution, and temperament, cattle of the Simental breed are to a high degree apt for work, the greater part of the labour of the fields being done with animals of this breed in their native homes. They are also used for haulage work on the roads. As regards general appearance, the form of the body and the characteristic signs are all a faithful expression of a breed created with combined aims in view. The whole body has an aspect of great strength without being coarse or brutal, as the types of the mountains were before they were brought under domestication.

FUNGUS NOTES.

RUSTS AND SMUTS OF INDIAN CORN.

The increased attention now being given to Indian corn production in some of the Lesser Antilles has already resulted in the recording of observations concerning the diseases affecting the plant. Under the conditions of the somewhat desultory planting of this crop which has hitherto been the rule, these diseases appear to have been negligible in their effects, but it is by no means certain or probable that they will so remain if the area of cultivation is increased. While, however, the question of diseases may require more attention than it has received in the past, experience in the large corn-growing countries does not suggest any undue amount of trouble from this source.

Of the diseases known to be present in the West Indies, the rusts (Uredineae) and smuts (Ustilagineae) are most likely to attract early attention, and to them this article will be confined. Their synonymy is so complicated that some uncertainty may be felt by readers who consult the articles concerning them in hand-books and periodicals, and so the alternative names under which they have been described or discussed are given to prevent confusion.

RUSTS.

The species of Sorghum (or Andropogon) such as imphee and Guinea corn are very commonly attacked in these islands by the rust fungus, *Puccinia purpurea*, Cke. (*Uredo Sorghi*, Fckl.). This is also one of the rusts which attacks maize. It may be distinguished on that plant by the deep purplish red discoloration produced on the leaves, like that familiar on imphee, and it has received the name of Red Rust of Maize in consequence.

The writer does not remember to have met with it or to have seen it recorded as occurring on maize in the West Indies, and it would seem from the literature consulted that it appears rarely, if at all, on maize in the United States. Mr. I. B. Pole-Evans, in the Report of the Department of Agriculture of the Union of South Africa, 1910-11, records it as occurring in that country, but apparently only in the province of Natal.

The maize rust commonly referred to in the American literature is *Puccinia Maydis*, Béreng (*P. Sorghi*, Schwein.), called by Pole-Evans the Brown Rust of Maize, in distinction from the previous species. Although identified with the species described as *P. Sorghi* by Schweinitz, there appears to be no established record of its occurrence on sorghum, and attempts to infect sorghum with spores produced on maize have failed.

Leaves of maize, heavily infested with this fungus, were recently forwarded to this Office by Mr. Robson, Curator of the Botanic Station at Montserrat, who reported that it was very prevalent on an 8-acre field planted some ten weeks previously, and had been common there from the time the plants flowered.

Comparatively little discoloration of the leaf is produced, but the brown pustules of the fungus are more or less conspicuous, according to the degree of infestation.

In the United States this rust is not regarded as having much economic importance. Usually it becomes common too late in the season to do much damage. When favoured by exceptional climatic conditions it may appear earlier, and have a considerable influence on the yield.

In South Africa, Pole-Evans says that although hitherto not regarded as serious, there is no doubt that the brown rust will before long have to be reckoned with as one of the most serious enemies of maize. The more that corn is grown the more the disease will manifest itself. Serious outbreaks have already occurred in certain districts, where in many instances a large proportion of the plants were so severely attacked that they set no cobs.

In South Africa, as in America, the alternate hosts of this fungus are species of Oxalis, and it was noticed that a severe epidemic at Pretoria was preceded by a heavy and most noticeable infestation of a species of Oxalis by its aecidial stage. Species of Oxalis are not uncommon in the West Indies. They are low tender herbs with trifoliate leaves, and may occur on waste land, or as weeds of cultivations.

The cereal rusts have so far proved very difficult to deal with in temperate climates, and the problem of their control has practically resolved itself into one of breeding resistant varieties. The life-history of the rusts which have been examined in the West Indies differs from the course followed in countries with a cold winter, in that the thick-walled resting spores, the teleutospores, appear to be seldom formed. Whether this renders the fungus more vulnerable can only be determined when the method by which the disease is carried over has been studied.

SMUTS.

The American corn smut, *Ustilago Zeae*, (Beck.) Ung. (*U. Mays-zeae*, *U. Maydis*) is widely distributed in the West Indies as in North America, without assuming any serious proportions. It is distinguished by the swellings to which it gives rise on the leaves, the ears, or the tassels, which may attain on the ears to an enormous size. The pustules are covered at first with a greyish envelope, which later bursts and reveals the black masses of spores. Any young and growing part of the plant is liable to infection. The leaves are usually first attacked, and the disease may be recognized at an early stage by the whitish swellings there arising.

When the spores are released a certain amount of direct infection may take place, but the capacity of the spores to germinate apart from the host plant on any moist nutritive material very greatly increases the possibilities of infection. In rich soil, for instance, or in manure heaps, a yeast-like growth takes place, with the result that myriads of conidia are formed, which are easily distributed by the wind, and are able to start the disease on any growing part of the corn plant they happen to reach. When the original spores do not attain to a situation which favours their growth they remain dormant, and are capable of germinating at any time, should the conditions become favourable, during a period usually to be measured in years.

It will be seen that the deposition of smutted material in cattle pens or manure heaps, or, since the spores can pass uninjured through the alimentary canal, the feeding of diseased plants to cattle, is a sure way of increasing and distributing the disease.

The idea that the smutted ears, of which cattle are very fond, are unwholesome as food, has not been borne out by experiments which have been made.

Certain smut diseases, in which infection is confined to the young seedlings, are capable of effective control by seed disinfection, but this is obviously not the case with the disease under consideration. Still, spores may very well be present on the seed, and where land is free from smut, and seed from an outside source is being used, disinfection may be worth while, and may be carried out as described on page 316 of Vol. XIII of this journal.

Where this species of smut already exists, the best means of control lies in the cutting out and absolute destruction of diseased plants, or their affected parts, before the spores are ripe.

Another smut disease, Head Smut, to which maize is liable, is due to the fungus *Sphacelotheca reiliana* (Kuhn), Cl. (*Sorosporium reilianum*, *Ustilago reiliana*). It attacks the cobs and tassels, and is usually confined to them, but may exceptionally occur on the leaves or bracts. It reduces the cob or tassel to a formless sooty mass, and may be distinguished by the absence of the monstrous swellings characteristic of the disease described above. It also occurs on sorghum, but must not be confused with the grain smut of that plant, more or less common in the West Indies, produced by *Sphacelotheca* [Ustilago] *sorghi*, in which the smutted grains remain distinct from each other. (*Agricultural News*, XIII, 316.)

The head smut is uncommon in North America, and has not, to the writer's knowledge, been recorded for the West Indies. In Victoria, Australia, according to Mr. D. McAlpine (*Vict. Journ. Agric.*, VIII, 290) it occurs to the extent of about 1 per cent. in some districts. McAlpine quotes an experiment which seems to show that infection only takes place in the seedling, and he reports that a reduction in the amount of the disease has followed disinfection of the seed with bluestone. Pole-Evans, on the other hand, (*Report Department of Agriculture*, South Africa, 1912-13,) states that it does not yield to seed treatment; and E. M. Freeman and H. J. C. Umberger (Circular 8, U. S. D. A. Bur. Pl. Ind.) say its life-history is not yet understood, but that enough is known to show that the treatments recommended for the grain smut of sorghum have absolutely no effect on the head smut.

THE OUTLOOK FOR FIXED OILS.

The Ceylon *Tropical Agriculturist* (November 1914) predicts in the following article a bright future for vegetable oils. In the West Indies we are interested principally in at least three oil-producing crops, viz., coco-nuts, cotton, and ground nuts. The views expressed below will therefore be of considerable interest:—

With copra only two-thirds the price of what it was a year ago, the prospect for fixed oil-producing seeds may not at the moment seem very bright, especially as the decline in price set in before the war; but the fact is, we believe, that the future for vegetable oils contains the elements of stability to a degree greater than that of most other major products of tropical agriculture. Science is making rapid advance in overcoming the objections to vegetable oils by depriving them of their unpleasant odours, and especially by converting them into solid fats, which can be used in soap making and possibly even in the preparation of margarine. Concurrently with progress made, vegetable oils and fats will gain popularity as food, not only because they are cheap, but also because they naturally enjoy more freedom from suspicion as disease carriers than fats and oils derived from the animal kingdom. Lubricants and drugs will probably share in any appreciation in price earned by fixed oils generally. From the producers' point of view, commercial oil seeds may be arranged in three classes. Firstly, of those mainly derived from forest or uncultivated trees, one only need engage our attention for the present, and that is palm oil seed. This product is certainly worth, and is receiving, study from planters. We have seen one industry of the West overthrown or nearly so by the planters of the East: does a like fate await the palm oil seed industry of the West Coast of Africa? As to this, we only venture the belief that industries carried on in ordered plantations will always in the end prevail over those that depend upon natural forests, in which trees are often widely scattered and immense distances have to be traversed. When, as in the East, plantations have densely populated countries to draw upon for labour, they become very dangerous rivals.

In the second category of tropical oil products, namely those produced from cultivated trees, the coco-nut may be said to enjoy a position almost by itself, and commanding as it does our perpetual study, need not detain us here; our object being to direct attention more particularly to annuals which, especially in Ceylon, are neglected. We do not know of any annual oil-producing product sufficiently remunerative to attract the large employer of labour. Unless he uses machinery for cultivating, harvesting, and threshing, which he does not as yet do, but has to depend upon hand labour, annuals, whether oil seeds or other products, are for him generally too expensive to touch as prime products. For this reason the attention now being given in some countries to oil-producing annuals like linseed, in anticipation of a rising demand for vegetable oils and fats, is of interest mainly to the peasant cultivator. Sesamum (gingelly) is the only annual (we are referring of course to oil seeds) systematically cultivated in Ceylon on a considerable scale, but there are others which we believe have possibilities, notably castor seeds, which though the weight per acre obtained is not great, possess the advantage of being large seeds, which can be picked or swept up on the ground, and not lost if shed, as in the case of gingelly. Ground nuts being a low creeping crop liable to be smothered, demand a lot of labour in weeding, as also in harvesting, practically every nut having to be picked. For this reason it is questionable whether the industry would appeal to favoured countries like Ceylon, but must not be left to develop in countries where it has chiefly taken firm root; though, on the other hand, it is worth more attention than it is receiving. Soya beans must also be tried again at different elevations. One of the richest oilseeds known to commerce is the Inhambane nut (*Telfairia pedata*), which, though not an annual, may be classed in this category. The kernel contains about 60 per cent. of oil. The seed is enveloped in a fibrous husk and a shell (as in the case of the coco-nut) difficult to decorticate, and is therefore shipped husk and all to the detriment of price. It is a mighty climber demanding for its accommodation large trees, which it suffocates in time with its deadly embrace, but it might prove feasible to keep it under reasonable control like other cucurbitous plants to which it is allied. It is being sown at Peradeniya. Linseed, to which increased attention is being devoted in many countries, is also being tried at Peradeniya, Anuraehapura, Nuwara Eliya, and Hakgala. It is a more temperate and subtropical rather than a tropical product, more suited probably to our medium and high elevations than to the low country. We recommend it for trial by members of the Ceylon Agricultural Society.

Referring to trade in Japan, *The Board of Trade Journal* for January 14, 1915, states that the activity of sugar markets in other parts of the world stimulated the Japanese market, and prices were rushed up, but a reaction occurred on receipt of advices from Europe of falling prices. The high prices have checked consumption, and several merchants have been compelled by financial condition to unload stocks which they had been holding. The output of refined sugar having been affected by shortage of raw sugar, dealings have been delayed until the time of the New season's crop in Formosa. In connexion with beans, it is stated that the new crop at the time of writing (October 29, 1914) has appeared on the market, and that there are few buyers, and prices have fallen steadily.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, February 9, 1914.

ARROWROOT—1¾*d.* to 4¾*d.*
BALATA—Sheet, 2/2¾; block, 1/10½ per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 80/- per cwt.; Grenada, 76/ to 68/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £26 per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 1/9 to 2/3; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
LOGWOOD—£4 10*s.*
MACE—7*d.* to 2/11*d.*
NUTMEGS—No quotations.
PIMENTO—Quiet.
RUBBER—Para, fine hard, 2/6; fine soft, 2/3; Castilloa, 1/10½.
RUM—Jamaica, no quotations.

New York.—Messrs. GILLESPIE BROS., & Co., July 24, 1914.

CACAO—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c.
COCO-NUTS—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
COFFEE—Jamaica, 9¾c. to 13½c. per lb.
GINGER—7½c. to 10c. per lb.
GOAT SKINS—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $2·50.
LIMES.—$3·75 to $4·50.
MACE—45c. to 53c. per lb.
NUTMEGS—110's, 11¾c.
ORANGES—Jamaica, $2·00 to $2·50.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., February 22, 1915.

CACAO—Venezuelan, $16·00 to $16·25; Trinidad, $15·25 to $15·75.
COCO-NUT OIL—93c. per Imperial gallon.
COFFEE—Venezuelan, 11c. per lb.
COPRA—$4·10 to $4·30 per 100 lb.
DHAL—No quotations.
ONIONS—$4·25 to $4·50 per 100 lb.
PEAS, SPLIT—$9·00 to $9·50 per bag.
POTATOES—English $1·40 to $1·50 per 100 lb.
RICE—Yellow, $6·00 to $6·25; White $5·75 to $6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados. Messrs. JAMES A. LYNCH & Co., Ltd. December 31, 1914, Messrs. T. S. GARRAWAY & Co., February 8, 1915.

ARROWROOT—$4·00 to $4·50 per 100 lb.
CACAO—$13·00 per 100 lb.
COCO-NUTS—$16·80.
HAY—$1·75 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$8·00 per 190 lb.
PEAS, SPLIT—$9·50; Canada, no quotations.
POTATOES—Nova Scotia, $3·25 per 160 lb.
RICE—Ballam, $6·10 to $6·35 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·00 per 100 lb.

British Guiana. Messrs. WIETING & RICHTER, February 6, 1915; Messrs. SANDBACH, PARKER & Co., February 19, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	14c. per lb.	14c. per lb.
CASSAVA—	$1·08	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$10 to $15 per M.	$18 per M.
COFFEE—Creole	——	16c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	16c. per lb.
Liberian	10c. per lb.	11c. per lb.
DHAL—	——	$6·40 per bag of 168 lb.
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	——
PEAS—Split	——	$11·50 to $12·00 per bag. (210 lb.)
Marseilles	——	——
PLANTAINS—	16c. to 40c.	——
POTATOES—Nova Scotia	$2·25 to $2·40	$2·25 to $2·40
Lisbon	——	——
POTATOES—Sweet, B'bados	$2·16	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
TANNIAS—	$2·16	——
YAMS—White	——	——
Buck	$2·04	——
SUGAR—Dark crystals	$3·40	$3·40
Yellow	$4·00 to $4·10	$4·00
White	$5·10 to $5·25	——
Molasses	$2·90	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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The Importance of Enclosures.

IT is the custom in most countries to regard the maintenance of enclosures an essential part of estate management, for it is well recognized that the protection afforded to the agriculturist by hedges and fences is of very great benefit. On West Indian estates and settlements, enclosures are notably conspicuous by their absence, and it has occurred to us that an enquiry into the causes and results of this neglect might have some influence in the way of modifying the rather one-sided policy hitherto pursued.

There are two systems of agriculture which in a general way are chiefly associated with the presence of enclosures: stock raising, and fruit or vegetable growing—the former because animals need restraint, the latter because edible produce requires protecting. Both these conditions obtain in the West Indies, and it may be observed that in Jamaica where stock raising constitutes an important industry, fencing is compulsory.

Looking at the subject first from the practical man's viewpoint, we see several firmly rooted objections, some of them very real, others somewhat imaginary. The most important objection is perhaps the trouble and expense of upkeep which enclosures entail. The amount of labour needed to keep hedges and fences in order on a large estate would undoubtedly be considerable. Then there is the circumstance that the presence of enclosures, especially on the large estate, hampers the harvesting and removal of crops. A third objection lies in the fact that hedges take up space which might be devoted otherwise to paying crops; they furthermore deprive the land of moisture, and to some extent help to harbour insect and fungoid pests. These latter objections apply more especially to the peasant holding, namely, the smaller properties, and in this connexion it may be observed that the harmfulness of hedges tends to increase as the size of the property enclosed gets smaller. The possibilities presented by fences constructed of wire naturally enters one's mind at this point; although this kind of fence is devoid of some of the disadvantages attendant on a living fence, their general employment is limited on the grounds of initial expense, and inefficiency as a barrier to would-be trespassers. Stake fences composed of locally grown timber are considered scarcely worth constructing

because of the rapidity with which most woods rot in a warm climate.

These are the principal practical objections to the erection of enclosures, and it will be useful now to see what ways there are of eliminating some of the difficulties on which the objections are based, as well as what corresponding advantages there may be in favour of enclosures. The first point, which had reference to the cost of upkeep of hedges, is a very vital one, but it must be faced from the point of view that the advantages obtained in other ways will counterbalance the cost of erection and expenses of upkeep. Coming to soil effects, the root action of hedges, resulting in loss of soil moisture for some yards within the enclosed area, can be lessened by trenching. This will serve a double function of drain, and barrier to the extension of roots. Trenching should not be carried out, however, to full extent until the young hedge has become thoroughly established. The next point is the question of the space occupied by hedges. The gravity of this objection depends largely upon what kind of hedges it is intended to grow. Some hedges are far bulkier than others. Information on the plants useful for hedge-making will be given later. As regards the harbouring of pests and diseases, another practical point commonly raised by the planter, it would seem that hedges are no worse in this respect than the headlands to the fields, which at the present time are often clothed with weeds.

We now come to the actual advantages of hedges. In the first place they constitute an efficient wind-break. The loss of moisture from the soil by increased evaporation due to the action of wind is probably just as great, if not greater than the loss of moisture through the root action of hedges. Then protection from wind improves the development of the growing crops themselves. It is hardly necessary to add that hedges save fields and gardens from the depredations of stock, if the hedges are constructed of a proper material; in the same connexion there is also their function in regard to human trespassers. Finally hedges are ornamental: they give a neat appearance to the estate or small holding, and ensure a considerable amount of privacy which would be impossible in their absence.

Leaving these practical considerations, we now come to another of a more abstract, though none the less important kind. A general impression seems to prevail in the West Indies that the protection of property is a direct function of the law. This misconception is probably responsible for much of the apathy displayed in regard to the erection of enclosures. It cannot be too well realized that the direct function of the law is to detect and punish crime. Prevention of crime is only indirectly the function of the law: it behoves the individual to protect his own property. Praedial larceny is admittedly a serious offence, and it should be heavily penalized; but it is only fair to remember that the opportunities for committing it in the West Indies are very ample. The arm of the law is never, even under the best circumstances, sufficient to prevent trespassing and theft. This is recognized even in the great cities with their highly efficient police and detective forces. To make this clearer, we may bring to the reader's notice the conditions of insurance against burglary, where the Company will not agree to pay up the cost of stolen goods unless the house has been actually broken into. It would appear that the only effort made at present in most of these colonies to protect crops and stock is through the employment of watchmen. This method is apparently considered more efficient and economical than the establishment of impenetrable barriers. Such a view is scarcely supported by practical experience.

It is important to bear in mind that what has been said applies to large and small owners alike. In most cases it is the peasant owner who feels the loss greatest, and it is especially in his interests to protect property by means of hedges and fences. If the watchman system were efficient and practicable, it ought not to be necessary to have to suggest in this way an alternative for an owner who lives practically in the middle of his own few rods of land. It may be argued by those who are not in sympathy with the proposal, that trespassing is unpreventible in this way. They will at any rate admit that the psycological effect of an enclosure would exercise a restraining influence.

Taking all the views expressed into consideration, it would appear reasonable to conclude that the establishment of enclosures is needed under some circumstances in the West Indies. It may not be futile to endeavour to strengthen this view by pointing out the importance of fences in regard to a rather different aspect of the subject, namely, the profitable management of live stock. Reference to veterinary reports which have appeared from time to time will show that the desirability of fencing pastures is very great in order to prevent the dissemination of disease, including ticks and other animal parasites. Some pastures are always more liable to contain infection

that others, and it is necessary to have a sharp line of demarcation. Moreover, the erection of fences obviates the unnatural tethering of animals, and permits of a better system of rotation. So we see that enclosures not only protect cultivated crops from domestic animals, but also protect domestic animals from disease under conditions more comfortable than when the animals are exposed.

It is not intended to overcrowd the general considerations of this article with experimental details, but it will give practical support to the policy of this article if we just enumerate a few of the plants in the West Indies that are known to be satisfactory hedge plants, as the result of experiment and common observation. Logwood (*Haematoxylon campechianum*), and some Acacias (as *Acacia tortuosa*) are suitable plants, offering considerable resistance to stock. Bread and Cheese (*Pithecolobium Unguis-cati*) is noted as a hedge plant. It has an excellent habit of growth, but it is rather bulky, and stock are inclined to pick at it. Mrytle lime (*Triphasia aurantiola*) is almost impenetrable if thickly trimmed, but it is rather slow of growth. On the other hand, Wild Coffee or 'Coffee bush' (*Clerodendron aculeatum*) is very quick growing, and can easily be raised from cuttings. Stock eat this also, but if well trimmed aud pruned it can be made into an imposing barrier. A good hedge can be grown from Barbados Cherry (*Malpighia glabra*), whilst Aralia may be recommended because it is compact without being bulky. Opuntias and other spined zerophytes should not be employed owing to their dangerous nature as weeds of cultivated land. For the restraint of stock, however, it is really essential to have spiny plants, and that is why some of the Acacia, and Mimosa bushes should be useful,—that together with the fact that their moisture requirements are small.

If ornamental effect is desired, there are the Jassmines and the Bougainvillaea. Unfortunately there is little exact information available in regard to the habit of the root systems, rate of growth, cost of upkeep. etc. of these different kinds of hedges. These matters the landowners can easily enquire into themselves, in co-operation with the local Agricultural Departments, which have already devoted considerable attention to the condition of hedges. It is particularly hoped that the peasant proprietor will give the subject more attention, since as already pointed out in this article, it is the small proprietor who can least afford to have his crops interfered with.

THE EXPERIMENT STATION, TORTOLA.

The quarterly report of the acting Curator for the four months ending December 1914 contains a detailed account of the operations carried out at the Station, and the conditions and progress of the plots. An active demand was maintained for onion plants throughout the quarter, and the preparation of seed beds, and sowing of seed occupied the greatest portion of the nursery work. The distribution of limes and coco-nut plants was also very considerable. Manurial experiments with pine-apples and lime trees were laid out. Those with lime trees are being conducted on a considerable scale, and should lead to interesting results.

The sweet potato variety plot was harvested during the month of December. On the whole, very fair weights were obtained. It is of interest to notice that the variety Harper headed the list with a yield of 13,000 lb. of potatoes, per acre, and was closely followed by Anguilla and Spooner.

In regard to the cotton industry, it is stated that heavy rains caused boll dropping in all districts of the Presidency.

Efforts are being made by the Experiment Station to encourage minor industries, and the cultivation of food crops has received special attention. Extensive and increased areas have been planted in onions, maize, sweet potatoes, and cassava. Much activity is evinced in the cultivation of limes and coco-nuts.

The report concludes with a list of the plants distributed from the Station during the quarter under review. This is as follows: onion plants, 60,000; coco-nut plants, 1,355; lime plants, 2,167; sweet potato cuttings, 17,000; cane cuttings, 2,000; cassava cuttings, 220; decorative and vegetables, 450.

This is a record distribution since the establishment of the Experiment Station.

St. Vincent Report on International Products Exhibition, 1914.—A copy has been received from the Agricultural Department, St. Vincent, of a memorandum prepared by Mr. W. N. Sands, as Commissioner for St. Vincent at the International Rubber and Products Exhibition held last year in London. In this it is stated that a large variety of St. Vincent products arrived in excellent order and were displayed to the best advantage. Considerable effort was made to advertise St. Vincent arrowroot, and Sea Island cotton from the same Colony. The prominent display of these two products attracted most attention from interested visitors. It will be remembered that the St. Vincent Permanent Exhibition Committee was awarded for its cotton exhibit a gold medal. Also in one of the competitive sections of the exhibits Argyle estate was awarded a silver cup and diploma for the best sample of cotton from the West Indies. These awards were presented by the British Cotton Growing Association. The St. Vincent section was visited by a large number of distinguished personages.

Work on the Land Settlements, Grenada.—In the report of the Land Officer for the month of January 1915, it is stated that sites have been selected, and arrangements made for compensation, for two new roads connecting the St. Cyr settlement roads with the Grand Etang main roads. Two new applications for land at Morne Rouge were applied for and the applications are being considered. At this settlement during the month, the ground nut and pigeon pea plots were reaped, whilst at Westerhall the manihot plant was harvested, and the produce sold. It should be noted here that the present Land Officer, Mr. W. N. Malins-Smith, only recently assumed the duties of his office (January 1) in succession to Mr. W. Bertrand.

FRUIT AND FRUIT TREES.

Robusta Coffee in Ceylon.—The young plants of Robusta coffee planted out next the parent plot, have developed both the leaf disease (*Hemeleia vastatrix*) and the scale (*Coccus viridis*) both of which are present to a slight extent on the parent bushes, which do not seem to be very much affected in general appearance. These young plants have no established shade.

Some year-old Robusta stumps raised from the same seed, were planted out in June under dense, established shade of *Leucaena glauca*, next a plot of Liberian coffee suffering heavily from both pests, and there is no sign of the Robusta plants having been affected from them. (The *Tropical Agriculturist*, December 1914.)

Areas Controlled by the United Fruit Company.—An interesting article in *Tropical Life* (January 1915) contains a review of a report recently issued by the United Fruit Company, which controls such large areas in Central America. It is stated that the 276,821 acres of improved land, owned and leased, under crops, are made up as follows: Columbia, under bananas, 18,334 acres, cacao 33 acres; Costa Rica, bananas, 462,73, cacao 625; Cuba, bananas, 88, cacao 846; Guatemala, bananas, 30,311; Honduras, bananas, 15,117; Jamaica, bananas, 10,521, cacao 77; Panama, bananas, 34,552, cacao 1,195.

Of other crops there are large areas under oranges, sugar-cane, coco-nuts, etc. It is understood that the banana crop is affected considerably with disease in Costa Rica, in which country also general administrative matters are in a condition of some instability. It is suggested that the company in course of time may substitute cacao for bananas in Costa Rica.

Testing of Lime Juice in St. Lucia.—The Agricultural Superintendent (Mr. A. J. Brooks) of the Botanic Station, St. Lucia, has forwarded the following notice concerning the testing of lime juice in St. Lucia, which has been published in the *Official Gazette*:—

To assist local lime juice manufactures in establishing a uniform grade of juice, the Agricultural Department of St. Lucia has made arrangements for testing samples of juice submitted to them for examination.

The examination of concentrated juice will include: (1) test showing acid content; (2) hydrometer reading; (3) test for sediment.

A fee of 1*s.* will be charged for each examination of raw juice, and 1*s.* 6*d.* for concentrated juice.

Samples of raw juice should be taken from the storage vat immediately after milling and straining. Samples of concentrated juice should be taken from the cooling vat, the contents being first thoroughly agitated before the sample is taken.

Samples of juice should be put into clean bottles containing about 12oz., securely sealed, labelled with the owner's name, and sent addressed to the Agricultural Superintendent, Castries, Botanic Gardens, or the Agricultural and Botanical Station, Choiseul.

The results of the test will be treated as confidential for the information of the person interested. No responsibility attaches to the Agricultural Department in respect to any report furnished.

Vanilla in the French West Indies.—Vanilla was introduced into Martinique a long time ago (about 1697), but its cultivation has not spread much, and it seems at present to remain stationary. During the four years from 1908-11 the greatest exportation took place in 1909 (4,590 lb., worth about £1,520), the least in 1911 (2,536 lb., worth about £955).

Vanilla planifolia was introduced into Guadeloupe in 1701; artificial pollination was begun in 1839, and a few years later the exportation of vanilla began; in 1911 it amounted to 39,267 lb., of the value of £13,352. The greatest quantity was exported in 1908, 68,242 lb., worth £10,871. Besides Mexican vanilla (*V. planifolia*), the native vanilla (*V. pompona*) is also grown to some extent.

Vanilla planifolia was introduced into Guiana about the year 1870 by the Administration of the penal settlement, but it did not gain a footing and its cultivation is now abandoned. (*Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, September 1914.)

Net Weight of Bags of Cacao of Different Countries.—The following table taken from the *Bulletin of the Department of Agriculture*, Trinidad and Tobago (Vol. XIV, Part I), should prove of interest, owing to the noticeable variation in the weight of the bags from different countries:—

	Cwt.
Surinam	2
British West Indies	1½ to 2
Guayaquil	1¾
Costa Rica	1¼ to 1½
Carupano, Sanchez and Samana	1 to 1½
Java	1 to 1½
Bahia	1¼
Ceylon	¾ to 1¼
Colombia, Caracas, St. Domingo, Africa, Venezuela and Puerto Cabello	1

Note on Banana Cultivation in Ceylon.—By continually cutting off and burning the diseased, yellow leaves of plants affected with Fusarium, the disease seems to be satisfactorily checked.

Practically the whole of the first crop of bunches has been cut, save in the red plantains which take fifteen months fully to mature, against the ten to twelve of the other varieties.

In the Puwalu variety, the parent plant was cut on July 17, i.e., at eleven months, and the two ratoons flowered two months later, yielding bunches fit to cut in three months' time. That is, the variety will yield three bunches worth 35c. each in sixteen months.

It has been said that the bunches in these plots are small compared to those elsewhere, but this may be due either to the elevation, or to the fact that Ceylon varieties are supposed to give larger bunches from the ratoons than from the parent—a reversal to that which takes place in the West Indies. But in any case, planting according to the West Indian methods has resulted here in earlier fruiting than planting in the ordinary Ceylon manner. (The *Tropical Agriculturist*, December 1914.)

SUGAR AND THE WAR.

Some strong points were brought out by Mr. E. R. Davson in a paper read recently in London before the Royal Society of Arts, on the subject of Great Britain's sugar supplies. The speaker began by giving a brief account of how Great Britain's supplies had been influenced by previous continental hostilities, and he sketched in outline how the great beet industry of Europe arose as the outcome of the Napoleonic troubles. Following this line of thought, the writer discussed the Brussels Convention and its effect upon colonial sugar.

Immediately before the outbreak of the present war, 75 per cent. of Great Britain's continental imports, or over 60 per cent. of her total sugar imports, amounting in value to £15,000,000, came last year from Germany and Austria. Consequent on the outbreak of hostilities the supplies were so seriously reduced as to result in the rise of prices to an extravagant and unjustifiable height—by 140 per cent. It has already been described in the *Agricultural News* how the British Government dealt with the situation, and it is unnecessary to say anything further in this abstract on this part of the subject. But in regard to what practically amounted to the 'commandeering' of colonial sugar, we may reasonably refer to Mr. Davson's pertinent remarks. 'By "commandeering" the crops of the Colonial producers, the Government has established the theory that producers of a commodity in the colonies are liable to have their commodity taken over by the Mother Country in time of need. This is no bad theory, but it seems to require the corrollary that to ensure such sources of supply in time of war, we must not neglect them in time of peace.'

Consideration was given next to the Royal Commission, appointed in 1905, to enquire into the conditions affecting the importation of food and raw material into the United Kingdom in time of war. The deliberations of this Commission were restricted principally to the question of wheat and cotton. As regards the former, the divided nature of the sources of supply were rightly considered a point of strength. But in the case of cotton, 60 per cent. had been coming from one country alone, namely America. The existence of this monopoly of supply was condemned by the Commission. This condemnation is interesting, since at the outbreak of war Great Britain was dependent on 60 per cent. of her sugar supply from what, as far as this war is concerned, we may call a single foreign source.

The principal argument expounded in the paper is of course the increased production of sugar within the Empire. Considerable attention is given to the efforts that have been made to establish a beet industry in England. The lack of success so far has been due, it is believed, to the inability of those concerned to start on a sufficiently large scale, and to do this, would need considerable Government support. In the case of sugar grown in the Tropics, the essential thing to remember is that any developments would merely constitute an extension and not fresh initiation as in the case of home-grown beet. It is well to bear in mind as well—though this and the previous point were not brought out in Mr. Davson's paper—that a British home sugar industry would be valuable as creating in England and Ireland a group of people understanding technicalities of sugar production in general.

The speaker proceeded next to survey the various tropical countries which are capable of producing more sugar, and attention was called to East and West, as well as South Africa, Mauritius, and the West Indies. As pointed out already in the *Agricultural News*, British East Africa imports practically all its own sugar. This is a discouraging example to encounter when considering the development of the tropical colonies as sources of supply for the home country.

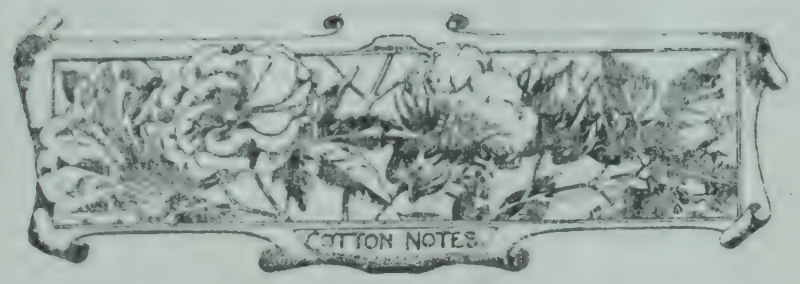
Everything concerning the proposed developments centres, of course, round the question of taxation. Mr. Davson made a strong point when he said that in encouraging colonial cane it is not suggested that tariff alterations should be allowed to increase the price, but only to waive the duty for the present on what is a very small percentage of Great Britain's supplies. It is true that as the percentage grew there would be a continual decrease of revenue, but one could hope that there would be a continual increase in wealth, so that Great Britain would not suffer.

The reading of the paper was followed by several lengthy discussions, which space does not permit our dealing with here. In conclusion, however, we may reproduce the following message sent to the meeting: 'Hope audience will realize that British cane sugar is not mere raw material, but the finished product of the highest agricultural and industrial skill.'

ST. VINCENT ARROWROOT.

A copy has been received of the report and statement of accounts of the Committee of Management of the St. Vincent Arrowroot Growers' and Exporters' Association for the year 1914. This contains an account of the efforts made to improve the position of St. Vincent arrowroot on the English and Canadian markets. During the early part of the year, a committee, constituted of representatives of leading brokers in London, was appointed with power to grade all association arrowroot and fix minimum prices, the standard being Grade E, whose minimum it was hoped might be maintained at $3\frac{1}{4}d.$ per lb. On account of the low level of prices resulting from a flooded market, it was decided later in the year not to increase production in the 1914-15 crop. It was also then decided to regulate shipments, by extending exportation of the crop over ten months of the year, each producer shipping not more than one-tenth of his crop per month. It will be commonly known by now that the Association has for some time experienced the difficulty of dealing with the produce of small growers who are not members. With a view to eliminating this difficulty, affecting not only the Association but also the general prosperity of the industry, it is hoped to establish a company to buy up the arrowroot of the non-members of the Association. The scheme is at present under consideration.

St. Vincent arrowroot has for many years justly maintained world-wide reputation. Its position, however, has of late been threatened by the appearance on the market of other forms of starch, which are sold to serve purposes which were originally monopolized by arrowroot. The Association has faced this competition with much vigour and ingenuity, by means of various forms of sale and advertisement. In the first place, an agreement with wholesale packers in Canada has been made for the sale of the so-called 'No-wyta' packets of arrowroot. In connexion with this scheme considerable sums of money have been appropriated for printing advertising booklets, and furnishing coloured packets with labels of an artistic design. A similar effort has been made in the United Kingdom. As well as this, the Association arranged for an excellent display of St. Vincent arrowroot at the Tropical Products Exhibition held in London last July. It is understood that Mr. C. J. Simmons (Chairman of the Managing Committee), while recently in London made a careful investigation into the arrowroot market conditions, and it is stated that he has devised a new plan which will be submitted in due course, whereby it is hoped that the position of St. Vincent in the arrowroot trade will be considerably benefited.



COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date February 23, with reference to the sales of West Indian Sea Island cotton:—

Since our last report the sales of West Indian Sea Island cotton have been confined to about 50 bales of medium quality Nevis at 12*d*. There is some enquiry at about this price, but no demand for the better grades at the moment.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended February 13, is as follows:—

The demand has continued for the limited offerings of odd bags, classing Fine and Fully Fine, which the Factors would consent to sell at our quotations, bnt much the larger portion of the unsold stock is held for an advance of 1c. to 2c., the Factors here thinking they should be able to sell on a parity with the prices now ruling in Savannah.

There has also been some demand for the crop lots, but at prices generally 2c. to 3c. below the views of the planters.

We quote, viz:—

Extra Fine	23c. = 14*d*.,	c.i.f. & 5 per cent.
Fully Fine	22c. = 13½*d*.,	,, ,, ,, ,,
Fine	20c. = 12½*d*.,	,, ,, ,, ,,
Fine off in colour	18c. = 11½*d*.,	,, ,, ,, ,,

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, Manchester, and Havre, up to February 13, 1915, were 103, 1,233, and nil bales, respectively.

Bulletin No. 121 of the United States Department of Agriculture, deals with spinning tests of Upland long staple cotton. It discusses soil types represented, variation in grades and staples, lengths, invisible lustre, card waste, relation of grade to waste, comparison at the comber, comber tests, value of waste differences, machine work, factors influencing waste, tests of breaking strength, and cultural characteristics; compares early and late picked cotton, and gives data on tests made at the New Bedford Textile School. This publication should be of special interest in the West Indies, in view of an endeavour which is being made to establish a system of commercial standardization of West Indian cotton. The Bulletin is reviewed in the *Experiment Station Record*, Vol. XXXI, No. 7.

DEPARTMENT NEWS.

Messrs. H. A. Ballou, M.Sc., Entomologist, and W. Nowell, D.I.C., Mycologist, on the staff of the Imperial Department of Agriculture, returned to Barbados by the C.R.M.S. 'Chignecto' from an official visit to Grenada on March 10, 1915.

INDIAN CORN.

CORN MEAL AS A FOOD, AND WAYS OF USING IT.

Under the title given above, the United States Department of Agriculture issued *Farmers' Bulletin* No. 565, in January 1914. This bulletin was prepared by C. T. Langworthy, Ph.D., D.Sc., Chief of Nutrition Investigations, in collaboration with Caroline L. Hunt, B.A., Expert in Nutrition, and has been largely drawn upon in the preparation of these notes. All the recipes given below are quoted from it, except that for cous-cous, as prepared in Barbados.

At the present time when the prospects are that high prices and possibly shortage of supplies will soon prevail in respect of wheat and all other imported foodstuffs, it should be of interest to consider the methods of using locally produced foodstuffs to the best advantage.

Indian corn is not new to residents in the American tropics, nor indeed to those of almost any part of the world, but perhaps there is no locality where this cereal furnishes the same variety in the foods of the people of all classes as in the United States.

In former days all corn meal consisted of the entire corn grains ground or crushed into a meal of varying degrees of fineness. Later, the process of preparation was improved so that the skin or enveloping membrane of the grains was removed, thus reducing the amount of crude fibre or bran in the meal. Still more recently the process has been further improved by the removal of the germ of the seed, which contains nearly all the fat or oil. This improvement has resulted in the production of a corn meal which possesses much better keeping qualities, since the fat has a tendency to undergo chemical changes which cause the meal to become rancid. The meal in which all or nearly all the bran and oil are present is called old-process meal, and that from which a large part of the bran and oil has been removed is known as new-process meal.

Probably all the corn meal imported into the West Indies is new-process meal, while that ground locally from locally grown corn is of the old-process type, which is fully equal to the imported meal when freshly ground from good corn, but which, as is well known, does not keep for any length of time without becoming rancid.

Everyone in the West Indies is familiar with the ordinary cous-cous or fungee. The early settlers in America used corn in much the same way in the preparation of their corn-meal mush or hasty pudding. In Italy, polenta; in Jamaica, 'Stamp and go'; and in America, scrapple; are similar dishes, with the addition of fats and proteids which make rations with a better balanced nutritive ratio.

When corn meal is used to form a large proportion of the food of a people it is generally combined with other things to increase the amount of protein and fat. In the ordinary course however, the use of corn might be largely increased in the West Indies without in any way upsetting the balance of the nutritive ratio, since nearly all classes of the population are able to provide themselves with the necessary amounts of proteids and fats to satisfy physiological requirements. The foods which supply relatively large amounts of proteids are meats of all kinds, eggs, milk, and leguminous seeds such as peas and beans. Fats are supplied in butter, lard, oil, pork, and to a considerable extent also, in good milk.

In cooking corn meal in the mush or cous-cous form it has been found that the best results are obtained by using

the double boiler, but it is likely that in the West Indies this culinary utensil is not in general use.

Before quoting recipes given in the bulletin on which these notes are based, it might be well to give the recipe for cous-cous as prepared in Barbados:—

COUS-COUS.

Cornmeal	½ lb.	Water	2 pints
Okras	8 to 10	Salt	1 teaspoonful

The okras are cut in slices and partially cooked in the water, to which the salt has been added; a part of the water is poured off and the meal is added to the okras and thoroughly stirred and boiled, the water which was poured off being added from time to time as needed. Boil for twenty minutes or until the corn is thoroughly cooked.

The following are taken from *Farmers' Bulletin* No. 565, quoted above:—

CORN-MEAL MUSH.

1 cup corn meal	3½ cups water or
1 teaspoonful salt	4 cups milk or milk and water.

Put all the ingredients into a double boiler and cook for four hours.

POLENTA.

This dish, which is common in Italy, differs little, except in name, from hasty pudding, though it is served in very different ways. Sometimes cheese is added during the cooking. Polenta is often reheated either with tomato sauce or a meat gravy left over from a meal, or with a meat gravy made from a small amount of meat bought for the purpose, or with half tomato sauce and half meat gravy. In any case, the dish is improved by sprinkling each layer of polenta with cheese. When the polenta is to be reheated in gravy, it is well to cut it into small pieces in order that the gravy may be well distributed through the dish.

SAUCES FOR POLENTA: TOMATO SAUCE.

2 tablespoonfuls butter	1 cup thick strained tomato juice
2 tablespoonfuls flour	salt and pepper.

Melt the butter; cook the flour thoroughly in it; add the tomato juice and seasonings; and cook until smooth, stirring constantly.

SAVOURY SAUCE.

Take 2 oz. of salt pork, bacon or sausage. If bacon or pork is used, cut it into small pieces. Heat until crisp but not burned. In the fat which dries out of the meat, cook a small amount of finely chopped onion and red or green pepper, being careful not to burn them. Add 1 cup of thick tomato juice or a larger amount of uncooked juice, and cook the mixture until it is reduced to a smaller amount. Season with salt. To this sauce capers, mushrooms, or finely chopped pickle may be added.

FRIED CORN-MEAL MUSH.

The custom of packing hasty pudding in granite pans, cutting it into slices, and frying it, is too common to call for special mention here. A less common method in this country [America] is that employed in Italy where polenta is usually spread in thin layers on a board and cut into small blocks. These blocks are egged and crumbled, and fried in deep fat. Another method is to mix corn meal in three times its volume of water and to cook it in water only long enough to form a mush, and to complete the cooking by frying the meal in butter or other fat. This is not so stiff as ordinary fried corn-meal mush, and has the advantage of requiring a shorter time for its preparation as the temperature of fat suitable for frying is far greater than that of boiling water.

ROAST PORK OR FRIED CHICKEN WITH CORN-MEAL MUSH.

Blocks of fried corn-meal mush are sometimes served with roast pork, and are a common accompaniment of fried chicken, particularly in the Southern States. The mush is made by the usual method, is cooled and cut in slices, and fried a delicate brown either in a greased pan or in deep fat.

ROAST PORK WITH BATTER PUDDING.

A dish corresponding to the Yorkshire pudding which is frequently served with roast beef can be made out of corn meal to serve with roast pork.

One-fourth cup corn meal	One-half teaspoon salt
1 cup milk	2 eggs

Place the milk, corn meal, and salt in the top of a double boiler and cook them about ten minutes, or until the meal has expanded to form a homogeneous mixture. After the mixture has cooled, add the eggs well beaten. Grease the tins thoroughly, allowing to each about 1 teaspoonful of fat from the roast pork. Bake in a moderate oven, basting occasionally with the drippings of the pork.

CORN-MEAL MUSH WITH FRUIT.

Corn-meal mush is often served with dried fruits, particularly with figs and dates. In preparing such fruit for use with the mush, it is usually necessary to soften it. This can easily be accomplished by washing the fruit and then heating it in a slow oven. As a result of the heat, the water remaining on the fruit is absorbed and the fruit softened and also dried on the surface.

CORN-MEAL MUSH WITH CHEESE.

For this dish, yellow corn meal is usually used. For a mush made with 1 cup of yellow corn meal the usual allowance is one-half cup, or 2 oz., of grated cheese. There is, however, no limit to the amount of cheese which can be added, and the addition of the cheese tends not only to make a more highly nitrogenous and nourishing dish, but also to make a dish which can be eaten without the addition of butter or cream. Like the ordinary corn-meal mush, it is often fried either in deep fat, after having been egged and crumbled, or in a small amount of fat.

Other recipes for cooking corn meal in the form of bread and cake will be given in a subsequent issue of the *Agricultural News*.

Balata Market in 1914.—Two very interesting charts are published in the *India Rubber Journal* for January 9, 1915, showing the fluctuations in the prices of West India sheet and Venezuela block balata during 1914. In the case of West India sheet the highest price was 2*s.* 11*d.* per ℔. (c. i. f. London terms) in February. From that date the price dropped steadily down to 2*s.* 5*d.* in July. Immediately after the outbreak of war, the value rose, but in September there was a sudden drop to 2*s.* at the end of October, from which date there was a slight rise of about 1*d.* per ℔. until the end of the year. In regard to Venezuela block, prices remained more steady during the first half of the year, though there was a sudden drop in September. The maximum and minimum prices were 2*s.* 1½*d.* per ℔. (February), and 1*s.* 7*d.* per ℔. (September), respectively.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

The editorial in this number discusses the advantages and disadvantages of establishing hedges and fences on West Indian estates.

Two important general articles appear in this issue on sugar and the war, and St. Vincent arrowroot, respectively.

A very useful collection of advice and recipes in regard to the cooking of Indian corn will be found on page 86.

Insect and Fungus Notes, which will be found on pages 90 and 94, respectively, deal with Nigerian pests, and citrus diseases in Florida.

Attention may be called to Students' Corner in this issue, which contains a useful list of books for the guidance of agricultural students.

Initialled Articles in the 'Agricultural News'.

The desirability of initialling certain articles in this journal has arisen principally in connexion with the Insect and Fungus Notes. It has been noticed from time to time that several of the entomological and mycological publications of both British and foreign origin frequently disregard notes containing original observations of considerable biological value, presumably because of the difficulty of including an unsigned article in a scientific bibliography containing a list of authors. As well as this reason, there is possibly another, dependent on the fact that anonymous technical notes lack the necessary authoritativeness. This circumstance, which has tended to limit the usefulness of the Department's work, it is now proposed to remedy.

Reference to the *West Indian Bulletin*, Vol. XI, No. 4, which deals with the history and organization of the Imperial Department, will show that, generally speaking, it has been the custom for the Entomologist to prepare the Insect Notes in each issue, the Mycologist the Fungus Notes, and for the Scientific Assistant to write the editorials and most of the general articles. The Insect and Fungus Notes will therefore be initialled in future by the respective officers, and, in certain cases, the editorials and other articles, at the discretion of the Imperial Commissioner. External contributions will be acknowledged in a preamble in the usual way.

This, and future issues of the *Agricultural News*, will include under Editorial Notices, a list of the official staff for the convenience of readers abroad.

In concluding this notification, it may be added that every effort is made in the *Agricultural News*, to insert information of direct interest to the West Indies and the Tropics generally. This policy can be assisted by readers, from whom communications containing brief comments, information or suggestions will be gladly received, and acknowledged in this journal, if made use of.

Forestry in Southern Nigeria.

The Annual Report on the Forest Administration of Southern Nigeria, 1913, just received, deals with the activities of the Department in several directions. In the section dealing with the regeneration of forests, interesting notes are given in connexion with departmental plantations and the girth measurement of trees. As in previous years, measurements were taken of the girths of various sample trees in one of the reserves. While the average annual girth increment of the wild growing trees in the Mamu Reserve is not very high, only a little over $\frac{1}{20}$-inch, the increment of the plantation trees in the Olokemeji Reserve is remarkable, amounting to about 3 inches, on the average. The reason for this does not seem to be clearly stated. Of most interest from the West Indian aspect is that part of the report dealing with minor forests products. Much attention has been given to the production of rubber, and efforts are being made to continue the output of Piassava fibre. The intro-

duction of a suitable machine will make these efforts more successful. A table is given showing the value of the principal forest products exported during 1912-13. The palm kernel and oil trade is worth nearly £4,000,000 annually. Other important products are fibre, rubber, gums and ivory. It is noted in the report that 50 lb. of palm oil seeds were sent to British Guiana during the year, where experiments are being made with the oil palm on plantation lines.

Stomata and Drought Resistance.

The *Experiment Station Record*, Vol. XXX, No. 7, gives an abstract of a paper dealing with the stomatal characteristics of varieties of sugar-cane (*West Indian Bulletin*, Vol. XIII, No. 4), and follows with another of interest to the West Indies on stomata and drought resistance in maize (Indian corn). It is stated that in the *South African Journal of Science* (1913), No. 8, a report appears on the study of the relationship between number of stomata present and power of drought resistance in Indian corn. The stomata were found to be larger but less numerous on the upper sides of the leaves. The author inclines to the view that the drought-resisting capacity does not bear any close relation to number of stomata, but that it is related to the presence of a peculiar structure on the epidermis of the leaves, in the form of small special groups or absorbing and storing cells, which are to be further investigated.

Views of a somewhat analogous kind were put forward in the second reference given above, in regard to the sugar-cane. It was thought that the distribution of certain varieties of cane would be limited to definite regions, were it not for the correlation between leaf habit, motor cells, etc., and stomatal characteristics.

Barbados Sugar-canes in India.

In the Report on the Agricultural Department of Assam for the year ending June 30, 1914, it is stated that the imported varieties of sugar-cane, viz., Striped Mauritius, B. 376, and B. 147 have shown marked superiority over the local varieties, both in yield and in quality of juice. Another Barbadian variety, B. 208, is expected to rank as one of the best in the future, although it seems to be very liable to attacks of the borer.

A comparison of the returns from B. 147 and the local variety, made by one of the planters, gives the following results per acre: Weight of cane: B. 147 = 40, 846. lb. Local variety = 22, 140 lb. Weight of juice: B. 147 = 22, 801 lb. Local variety = 10, 604 lb. Value of sugar produced from B. 147 = 288 rupees, from local variety = 125 rupees

This is a striking example of the value of some of the new varieties of cane which have been produced in Barbados, even under very different conditions of climate and soil from their original place of production.

Publications of the Imperial Department of Agriculture.

Cotton Cultivation in the West Indies (Pamphlet No. 74), lately issued by the Imperial Department of Agriculture, has received notice in recent issues of *Nature* and the *India-Rubber World*, respectively. It is stated in *Nature*: 'this comprehensive account of Sea Island cotton in the West Indies . . . . forms a very trustworthy guide to those concerned in the West Indian cotton industry . . . the pamphlet . . . is very well illustrated; the general information has been selected with great care, and the compilers are to be congratulated on the preparation of so useful a manual.'

The subject of Sea Island cotton is of some interest to the rubber growers and manufacturers, in that this fibre is employed in the manufacture of certain rubber articles, for example, pneumatic tyres. The *India-Rubber World* observes that, in view of the increasing importance of cotton growing, this useful pamphlet has been issued, and the information has been brought up to date and numerous photogravure illustrations included. The Pamphlet is also referred to as an important publication for the textile industry, in *The Board of Trade Journal*.

Chemical Auditing versus Chemical Control.

It is interesting to note from the Hawaiian letter to the *Louisiana Planter*, February 13, 1915, that the term 'auditing' chemist is to be employed in connexion with a large group of sugar factories in Hawaii as the official designation of their supervising chemist.

Some years ago Dr. Francis Watts, during the course of the negotiations for the erection of Gunthorpe's Sugar Factory in Antigua, made use of this appellation, as a suitable description of a chemist to be attached to such a factory, because it represented the work which might be expected of him.

It has been usual hitherto to speak of chemical control of a factory. This term is rather misleading, because the control of a factory, in the sense of direction, is the business of the manager, not of the chemist. The work of the chemist is much better described as audit. His analysis of the products of the factory enables him to check the returns, and so to be able either to state that the working is satisfactory, or to point out where there is wastage, or to suggest where some improvement may be made so as to secure better results.

An 'auditing chemist' ought therefore to be a man with a wide knowledge of nearly every activity connected with the production of sugar, for he may be called upon to give advice on any thing which tends to increased yield in tonnage of cane or richness of juice. Besides this, from his analyses he has to check the efficiency of the mills, and all the process of manufacture. Perhaps therefore the term 'auditing chemists', as the designation of cane factory chemists, has come to take a permanent place in the nomenclature of the industry.

INSECT NOTES.

AGRICULTURAL PESTS, NIGERIA.

II.

The following is a continuation of the abstract of the report on insect pests in Nigeria, Southern Provinces; the first part appeared in the last issue of the *Agricultural News*.

CACAO—CONTINUED.

The stem of the cacao plant was attacked by the larvae of the moth, *Eulophonotus myrmeleon*, Feld., the only representative of the family Megalopygidae known to occur outside the American hemisphere. This is the only cacao borer found. It tunnels in the medium sized branches, rarely in the main stem. The attacked branches drop their leaves and eventually die.

The common method of dealing with this cacao borer is to cut off the dead and dying branches, and to leave them on the ground. This probably does not kill the borers; to accomplish this, the infested branches should be burned.

The boring larvae may be killed in the branches in the early stages of the attack by probing the tunnels with a flexible wire, or by injecting carbon bisulphide into the tunnels and plugging the opening with damp clay.

The bark sapper or rind bug (*Sahlbergella theobroma*, Dist.) has occurred in certain districts as a serious pest, and in others in small numbers.

The scale insects attacking cacao in Southern Nigeria are not serious pests. They include one or more species of Dactylopius, *Stictococcus sjösteadi*, Newst., and *Stictococcus dimorphus*, Newst. The latter is a recognized pest of pigeon peas and probably invades the cacao to a slight extent from that plant, which is commonly used as a shade plant. In addition to these is a species of Icerya, which was common on pigeon peas, and also occasionally found on cacao.

The species of Dactylopius are commonly held in check in Nigeria by the larvae of a Lycaenid butterfly (*Spalgis lemolea*, H. H. Druce). On small plants the Dactylopius scale is treated also by being brushed over with kerosene emulsion.

The cacao pods were attacked by only a few insects, and very little damage was done by them.

Termites are numerous, eating away the dead wood of cacao trees. They were not found eating away living wood, but it is likely that as the dead wood is eaten the live wood dies faster, and thus their action hastens decay. Dead plants on native farms are not often removed until they become infested with termites, and frequently no other cause was to be seen to account for the death of the tree; but it is stated that these insects follow close on fungus attacks, and perhaps trees dying from fungus diseases are attacked by termites, and their death hastened.

The termites were successfully combated by the use of the 'Universal Ant Destroyer'—a machine by means of which sulphurous and arsenical vapours, with a mixture of carbon monoxide and dioxide, are pumped into the termitarium. (An account of this machine was given in the *Agricultural News*, Vol. XI, p. 122.)

MAIZE.

The leaf-eating pests attacking maize are not numerous, the most important being lepidopterous larvae. The life-history of one of these lepidopterous insects (*Prodenia litura*, F.), was worked out. The female parent moth deposits her eggs en masse on the underside of the corn leaves, protecting and concealing them with hairs and scales from her abdomen. The larvae hatch in about three days and attain full growth in about three and a half to four weeks. The pupa stage lasts about eight days. When the larvae are about two-thirds grown they conceal themselves in the heart of the plant, and it is at this time that greatest damage is done, for they eat off the young undeveloped leaves and destroy the growing shoot.

The earwig (*Elaunon erythrocephalus*, Oliv.) damaged young maize plants by boring into the base of the leaves, and congregating there in numbers. These insects breed on the plants, the parent female often being found brooding over a batch of ten to fifteen eggs, or a family of young.

The larvae of at least two moths were found on leaves of corn, but not in abundance or doing much damage. The caterpillars of two moths of the family Lymantriidae attacked the silks, eating them away flush with the tip of the husk. If this happened before pollination took place the ear could not develop.

The pests which attack the stem and the ear of the corn are more numerous and more important. There are three species of moth, the larvae of which are borers in the stems and ears. These are *Sesamia calamistis*, Hmp., *Eldana saccharina*, Walk., and *Busseola fusca*, Hmp. The effect produced by these borers varied with the age of the plant. Young plants withered and sometimes died; older plants survived, but showed the effects of the attack by their stunted growth and withered appearance, and by the failure of the ears to develop properly.

When plants bearing ears are attacked, these seem to be preferred to the stem, but the method of attack varies with each insect. The larvae of Sesamia usually feed in the cob, not as a rule touching the kernels of grain. The larvae of Eldana, on the other hand, prefer the kernels, through which they tunnel in all directions, pupating when full-grown in a white silken cocoon, either among the kernels or in the husk.

The two common species, Sesamia and Eldana, are parasitized by a Tachinid fly, which in its turn is attacked by a hymenopterous parasite.

The larvae of these two species have been found in stalks of corn plants that have been left standing after the ears have been removed, these stalks thus providing good breeding places for the pest. The larvae of Sesamia and Eladana have also been found breeding in the stems of a coarse grass, which is abundant in the Ibadan district.

Another caterpillar, a bright pink larva of a Noctuid moth, feeds on the silk of the ear inside the husk. When this attack occurs before the grains are fertilized the ear, of course, does not develop; but when, as often happens, the injury takes place after pollination, no serious harm is done.

Toward the end of the maize season another caterpillar pest, the larvae of the Pyralid moth (*Mussidia nigrivenella*, Rag.), was found in the almost ripe ears. This is important since this insect is one of the chief pests attacking stored grain, the first infection taking place in the field, and subsequent generations developing in the store.

The experiments as to the control of the borers in corn have given results which indicate that the burial of all stalks and other corn refuse immediately after gathering the ears is quite satisfactory. The formation of a compost heap of the refuse is equally effective.

The pests which attack stored grain are of much the same kind as in other parts of the world, and indeed many of the species are the same: *Calandra oryzae*, *Tribolium confusum*, *Tenebrioides mauritanicus*, and another small brown

beetle, and the moths, *Mussidia nigrivenella* and *Ephestia cautella* occurred in abundance, severely attacking corn soon after it was stored. The larvae of the weevil, *Calandra oryzae*, were attacked by a hymenopterous parasite (*Meraporus* sp.).

It was found that these insects infest the grain in the field; that Calandra has not the power to penetrate the husk, but gains admission to the grain either through the tip of the ear or through holes in the husk made by borers; and that Trilobium is able to make its way through the husk to to the grain. A few experiments were made in an effort to find a sacking material proof against Calandra and Trilobium. It was found that while the former cannot penetrate a coarse drill, the latter has no difficulty in doing so. Carbon bisulphide, used at the rate of 5 lb. per 1,000 cubic feet of space, appeared to give good results in the fumigation of the stored grain, but reinfestation resulted from imperfect construction of the bins. Carbon dioxide also gave good results as a fumigant for stored maize.

MISCELLANEOUS.

Kola. The young shoots of kola were attacked by a Delphacid leaf hopper (*Pundaluoya simplicia*, Dist.). They were treated by brushing with a week kerosene emulsion. The Adoretus beetle which attacked young cacao plants in the nursery attacked kola in the same way, and the grasshoppers attacked the leaves. They were controlled by the usual stomach poisons. Kola nuts on the tree and in storage were attacked by two weevils: *Paremydica insperata*, Fst., and *Balanogastris kolae*, Desbe. These were parasitized by an Ichneumonid.

Coffee. Only one leaf eater of importance occurred on coffee. This was the caterpillar of the moth *Metadrepana glauca*, Hmp. The coreid bug (*Riptortus tenuicornis*, Dall.), previously recorded as a pest of this crop, was not abundant. Scale insects occurred but not in great numbers.

Rubber. Para rubber was attacked by the grasshopper already mentioned, which ate the leaves, and by the large cricket, *Brachytrypes membranaceus*, Drury, which attacked the roots. This latter was held in check by a fossorial wasp (*Chlorion xanthoceros*, Illig., var. *instabilis*, Sm.). *Funtumia elastica* was more subject to insect attacks, the leaves being eaten by the larvae of two Lepidopterous insects, *Nephele* sp., a Sphingid moth, and *Glyphodes ocellata*, Hmp., a Pyralid leaf roller, and the trees were attacked at the base of the stems by a borer, probably the larva of a beetle. Funtumia pods when open were found to contain a variety of insect pests.

Ground Nuts were attacked by a leaf-eating caterpillar, *Metisa sierricola*, and a scale insect, *Ceronema africana*.

Beans grown for green dressings were attacked by three beetles: *Lagria villosa*, L., *L. viridipennis*, and *Ootheca mutabilis*. They were controlled by collecting with light nets in the hands of small boys.

Pigeon pea is not of great importance in Nigeria, being used for shade in young plantations of cacao. On account of its possible utility as a food crop, however, it has been kept under observation, and the insect pests attacking it have been noted. Several scale insects, several leaf-eating larvae, and a froghopper are recorded as attacking this plant.

Oil palms, which had been scorched by fire, were attacked by the weevil *Calandra oryzae*.

Sweet potatoes were attacked by the larvae of the sweet potato hawk moth (*Herse cingulata*). The stored potatoes were attacked by weevils: *Cylas brunneus* and *C. puncticollis*.

H. A. B.

THE FLORA OF THE AZORES.

Many West Indians have had occasion to visit the Azores. In view of the geographically transitional nature of the plants of those islands compared with the characteristic species of Tropical America and Northern Europe, and considering the Azores, like most of the West Indies are mountainous islands, the following summary (taken from the *Kew Bulletin of Miscellaneous Information*, No. 9 of 1914) may be found of interest:—

The author endeavours to describe briefly some of the most conspicuous features of the native vegetation of the Azores as illustrated on the mountain of Pico. In so doing, he directs attention mainly to the vertical distribution of the plants.

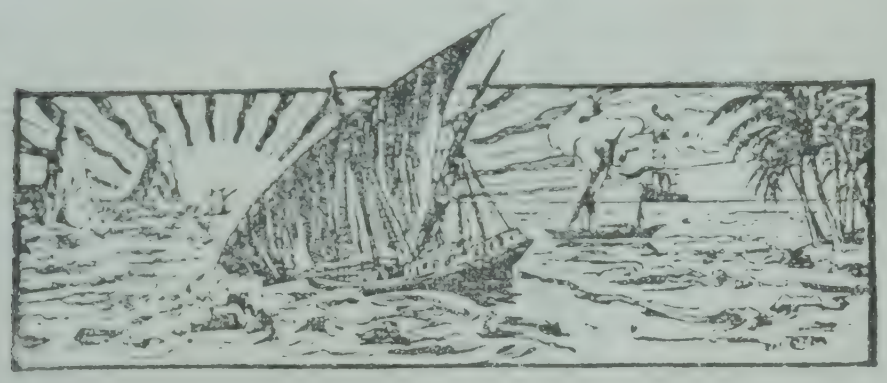
After pointing out that for purposes of comparison with Madeira and the Canaries the Azores should be regarded as presenting conditions for forest-growth up to levels of 3,000 to 4,000 feet (p. 307), he gives the zones of vegetation (p. 308), (1) the Faya [*Myrica faya*] zone, up to 2,000 or 2,500 feet; (2) the Juniper and Daphne zone, 2,000-4, 500 feet; (3) the *Calluna*, *Menziesia* and *Thymus* zone, 5,000 feet to the summit; (4) the Upland moors, 2,000-4,000 feet.

A reference to the climatic conditions (p. 309) is followed by a general account of the native vegetation of the mountain (pp. 309-15). Beginning with that of the summit and of the higher levels (p. 310), he then describes in their order the plants of the upper woods or Juniper and Daphne zone (p. 311), of the lower woods or Faya zone (p. 313), and of the Upland moors (p. 313).

After alluding to the relatively small number of indigenous plants as compared with introduced plants (p. 315), the composition of the forest of evergreens that clothed the islands at the time of their discovery is discussed (p. 316), and the early writers are quoted in support of the view that the trees of the original woods were of far greater size than at present. It is then shown that although in the existing woods the trees are of small size on account of the persistent agency of the woodcutter, they attain respectable dimensions when allowed to grow undisturbed (p. 317).

With regard to the general affinities of the Azorean flora it is remarked that, whilst the plants of the upland moors are in the mass European species that do not occur either in Madeira or in the Canaries, most of the characteristic trees and shrubs of the woods are non-European and either exist in the other two groups or are represented there by closely related species (p. 317). It is suggested, in passing, that the European element in the woods was mainly derived by way of the Atlas Mountains (p. 318). The woods of the Azores, as regards their component trees and shrubs, are to be compared with the 'laurel belt' that forms the middle zone of vegetation on the slopes of Teneriffe. The lower African zone and the higher region of pines as displayed on that mountain are not to be found in the Azores, their absence being due to lack of the requisite climatic conditions in the first case, and to want of suitable soil conditions on the high levels of Pico in the second case (p. 319).

Finally, it is shown that the marked endemism of the Canarian and Madeiran floras is but slightly displayed in that of the Azores. The revolutions in plant-life which are suggested by the presence in the other two groups of representatives of genera, now exclusively American, cannot be predicated for the Azores. On the contrary, the Azorean plants supply us with a story of to-day for the upland moor, and of yesterday for the mountain wood.



GLEANINGS.

According to *The Board of Trade Journal* for January 28, 1915, the attempts made in Tunis during 1913 to produce cotton did not yield any satisfactory results. The year 1914 has been even less encouraging. The limiting factor appears to be drought.

The cultivation of tea is in an experimental stage, or is not being actively exploited in the following countries: Uganda and Nigeria, Siam and the Straits Settlements, Brazil and Peru, Mauritius, the Azores, Fiji Isles, South Carolina, and Natal. (The *Planter's Chronicle* of Southern India, December 10, 1914.)

Sunn hemp fibre (*Crotolaria juncea*) is dealt with in an article in the *Wealth of India* for December 1914. It is used in the manufacture of ropes, fishing nets, saddles for pack horses, hose pipes, etc. Sunn hemp has considerable tensile strength, and like European hemp, its tendency to rot under water seems to be very slight.

The pruning of trees is discussed in the *Planters' Chronicle* of Southern India (November 7, 1914). It is pointed out that bad and useless wood must be removed before the bushes can benefit fully from intensive treatment of the soil. The article in question contains a considerable amount of practical information, which should be useful to those interested in this crop.

The Castor oil plant, according to the *Journal of the Royal Horticultural Society* (November 1914), should prove extremely useful as a detective of ethylene in laboratories, green houses, and rooms where coal gas is burnt. A very small amount, ·00001 per cent. of ethylene produced a definite response, and 1 part per million produced drooping of petioles or folding down of laminas.

The St. Vincent Agricultural Department is prepared to distribute disinfected cuttings of the best varieties of sugar-cane at 6*d*. per 100. The following kinds are included in the list published in the St. Vincent *Government Gazette*: B. 208, B. 1753, D. 95, B. 6450, Scaly Seedling, B. 4596. It will be noticed that all these are very well known varieties, both in Barbados and the Leeward Islands.

The summary of results of the soil investigation work in Assam, for the year 1913-14, is given in the Annual Report on the Agricultural Experiments and Demonstrations. Experiments for some time have shown that in order to grow most ordinary crops a preliminary dressing of lime is absolutely essential. It is hoped that in future years more light will be thrown on the problem of the right quantity to apply.

The Agricultural Superintendent, St. Lucia, reports as follows on the condition of the staple crops in December 1914. The cacao crop was heavy and early; the reaping of sugar had begun on the large estates; the lime crop was slackening. The rainfall at the Botanic Station during December was 10:87 inches; at Réunion 8:23 inches

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It is stated in the *Journal of Agriculture* of New Zealand for November 20, 1914, that the Phormium fibre industry is feeling the effects of the war, probably more seriously than any other branch of production in that country. During the quarter ended September 1914, only 14,899 bales of hemp were milled, as against 28,651 bales in the corresponding quarter of last year. However, the hemp has been of a better quality during the past six months.

The yield of pigeon peas obtained at Salisbury in Rhodesia was at the rate of 1,350 lb. of seed per acre. The stalks of pigeon peas are largely used as fodder, and it has been suggested that a mixture of peas and Napier's fodder would provide an excellent green pasture mixture, the Napier's fodder being cut for ensilage. The admixture of forage crops, so common in English agriculture, is worth more attention in the Tropics, particularly combination between the graminaceous and leguminous crops.

Useful bulletins are being issued by the Agricultural Department of the Southern Provinces, Nigeria. A copy has recently been received of Bulletin No. 2—Mycology, Part I, entitled Fungus Diseases of Plants and Their Treatment. The subject-matter is well written, and deals in a general way with the prevention of plant diseases. It is proposed to follow up the present publication with a series of papers on special diseases of different crops. The next of the series will deal with root disease of Para rubber and cacao.

Agricultural education in the primary schools of Grenada is reported on in the *Government Gazette* for January 4, 1915. Five schools offered this subject, but only three of them possessed gardens. It is important to note that four of the five teachers who offered this subject had gone through at least one full course of lectures under the auspices of the Imperial Department of Agriculture. The usual course of elementary instruction in plant life, with its application to local conditions was done satisfactorily. An Assistant Inspector of Schools arrived from England last March. In view of the fact that this officer has science qualifications, it is likely that the study and teaching of agriculture will be advanced in the Grenada elementary schools.

The Egyptian Ministry of Agriculture has forwarded to this Office a copy of Circular No. 60, dealing with the prevention of the re-infection of fumigated citrus trees in that country. It is pointed out that re-infection comes, to a very great extent, from scale insects left on dead leaves, and fruit lying on the ground near by the trees. Two important rules are deduced: (1) orange trees should have all their lower branches pruned off, and should have bared trunks for the first 50 or 60 centimetres above the ground; (2) it is absolutely necessary to keep the ground near by the trees free from dead leaves and fallen fruit. The interlacing of branches should be prevented also by judicious pruning. The above instructions apply to a large extent to West Indian conditions.

STUDENTS' CORNER.

REVISED COURSES OF READING.

The Circular issued in February 1910 on Courses of Reading and Examinations in Practical Agriculture under the Imperial Department of Agriculture for the West Indies has now been revised in regard to the references given for the students' guidance. The syllabus of examinations has not been altered, with the exception that coco-nuts has been included as an optional crop subject. The following is the revised general list of books recommended for use in connexion with these courses. It is not expected that any student should procure *all* the books listed. A careful choice should be made of those books likely to be of greatest value to the individual students. In making this choice, the assistance of the officers of the Local Department of Agriculture should be sought.

General Agricultural Science.

'Bacteria in Relation to Country Life', by Lipman, published by Macmillan.

'Catechism of Agricultural Chemistry', by Johnson, published by Blackwood & Sons, 1*s*.

'Chemistry of the Garden', by H. H. Cousins, published by Macmillan, 1*s*.

'Elementary Tropical Agriculture', by Johnson, published by J. Murray.

'Elements of Agriculture', by W. Freeman, published by J. Murray, 2*s*. 6*d*.

'Feeding of Crops and Stock', by A. D. Hall, published by J. Murray, 5*s*.

'Fertilizers and Manures', by A. D. Hall, published by John Murray, 5*s*.

'Nature Teaching', by Francis Watts, published by the Imperial Department of Agriculture, West Indies, 2*s*. 6*d*.

'Physics of Agriculture', by King.

'Principles of Plant Culture', by Goff, published by the Author.

'Soils', by Fletcher.

'Southern Agriculture,' by Earle.

Sugar.

'Sugar and the Sugar-cane', by Noel Deerr, published by N. Rodger, Altrintham, Manchester, 1*s*.

'Introductory Manual for Sugar Growers', by F. Watts (out of print).

'The Cane Sugar Factory', by F. I. Scard, published by the West India Committee, 1*s*.

'Lectures to Sugar Planters', published by the Imperial Department of Agriculture, West Indies, 1*s*.

'Cane Sugar and its Manufacture', by Prinsen Geerligs, published by Norman Rodger.

Cacao.

'Cocoa', by van Hall, published by Macmillan, 14*s*.

'Cacao', by J. H. Hart, published by Davidson & Todd, Trinidad.

'Cacao, its Botany, Cultivation, Chemistry and Diseases', by Herbert Wright, published by Ferguson, Columbo & London, 7*s*. 6*d*.

'The Fermentation of Cacao', edited by Hamel Smith.

Bananas.

'The Banana', by W. Fawcett, published by Duckworth, 7*s*. 6*d*.

Coco-nuts.

'The Coco-nuts', by E. P. Copeland, published by Macmillan, 10*s*.

Pamphlets Dealing with the Above and Other Subjects.

(issued by the imperial department of agriculture.)

No. (17) General Treatment of Fungoid Pests. Price 4*d*.
,, (43) Cotton Seed and Cotton-cake-meal on West Indian Plantations. Price 2*d*.
No. (54) Fungus Diseases of Cacao and Sanitation of Cacao Orchids. Price 4*d*.
No. (58) Insect Pests of Cacao. Price 4*d*.
,, (60) Cotton Gins. How to erect and work them. Price 4*d*.
No. (61) The Grafting of Cacao. Price 4*d*.
,, (65) Hints on School Gardens. Fourth Edition.
,, (69) Hints to Settlers in St. Lucia. Price 6*d*.
,, (70) Coco-nut Cultivation in the West Indies. Price 6*d*.
No. (71) Insect Pests of the Lesser Antilles. Price 1*s*. 3*d*.
,, (72) Lime Cultivation in the West Indies. Price 9*d*.
,, (73) Root Borers and other Grubs in West Indian Soils. Price 6*d*.
No. (74) Cotton Cultivation in the West Indies. Price 9*d*.
No. (75) Insect Pests of Sugar-cane in Antigua and St. Kitts. Price 6*d*.
No. (76) Indian Corn. Price 4*d*.

West Indian Bulletin References.

The Scarabee of the Sweet Potato, Vol. X, p. 180.
Root Disease of the Sugar-cane, Vol. IX, p. 103.

Agricultural News.

Articles on the Life-history of the Fungi, Vol. VIII, Nos. 190, and 192.

NOTICE TO FINAL STUDENTS.—In the *Agricultural News*, Vol. XI, Nos. 271, 273 and 274, Students' Corner consists of specially prepared notes on the references in the publications of the Imperial Department to estate management, embracing such subjects as agricultural labour, machinery, building construction, surveying, co-operation, law, etc. These notes should be carefully perused and brought up to date by referring to the indexes of the *West Indian Bulletin*, Vol. XII, and the *Agricultural News*, Vols. XII and XIII, together with the table of contents in the recently published pamphlets and annual reports.

An interesting note on fuel consumption of gasolene engines per horse power appears in the 1913 report of the Director of the Agricultural Experiment Station of the University of Wisconsin. The sizes of the farm engines commonly used range from 1 to 10 horse power. It is often proved that a much smaller engine is purchased than is necessary for some of the work to be done, with the idea that the smaller engines will be more economical for the usual small load. To determine the economy of engines of various sizes under different loads, a series of tests was made with farm engines of from 3 to 6 h.p. It was found that the larger engines were just as economical in the use of fuel, on a small load, as are the smaller engines when carrying the same load,—an exceedingly important fact to bear in mind when selecting an engine.

FUNGUS NOTES.

INVESTIGATION OF CITRUS DISEASES IN FLORIDA.

Mycological investigations in Florida during 1911 were described in the *Agricultural News*, Vol. XII, p. 398. The present article, based on the Report of the Agricultural Experiment Station, for the year ending June 30, 1913, reviews a continuation of the work previously recorded.

Hitherto in Florida, the work of principal interest to the West Indies has been the campaign against the Citrus white fly (*Aleurodes citri*), by spraying with the spores of entomogenous fungi—parallel with the campaign against the froghopper in Trinidad. This work has been continued in Florida with interesting results, which will be given later in this article. As well as this work just mentioned, the report under review refers to several new lines of investigation. The first one deals with the control of die-back by Bordeaux mixture.

Die-back of Citrus trees is a malady supposed to be due to physiological causes. The reason for testing the effect of Bordeaux depended on the circumstance that there is evidence from practice and experiment, that this spray has a stimulating effect on plant tissues. The trees were sprayed thoroughly with Bordeaux of 5:5:50 strength, twice during the spring of 1912. Within ten days after spraying with Bordeaux mixture, the trees were sprayed thoroughly with an insecticide in order to control the scale insects, which experience has taught will greatly increase in numbers after the use of copper sprays on account of the killing of the entomogenous fungi, which hold the scale insects in control. On the whole, the treatment was found to be effective: Bordeaux mixture appears to be a useful spray for the control of die-back; but its benefits were somewhat hidden by a decrease of the disease due to natural causes. The effect of the insecticide used after the Bordeaux is marked by the lack of any great increase of scale over that existing before the experiment was started.

Turning to another section of the report, we find an account of an interesting piece of work on the gumming of Citrus produced by chemicals. It is worthy of observation that in the die-back investigation, the stimulating effect of poisons in small doses was the underlying principle; in the case of the effect of chemicals on gumming, it is the morbid effect of poisons that is taken into account. To continue, some twenty-eight different organic and inorganic chemicals were placed beneath the bark, or in holes in the trunk, or were painted on the surface of the bark. The production of gum was coincident with the injury caused by the chemical. The most copious production of gum was caused by copper sulphate and the other salts of the heavy metals—interesting in view of the beneficial effects of copper in the form of Bordeaux mixture—and the injury extended from the point of insertion in the bud or stock, to the upper branches. The injury caused by the other compounds was confined to the region of insertion. The amount of gum formed in this case was small, and gum production was associated with the place of chemical injury. In all cases the gum was of the same character and appearance.

Coming now to the campaign against Citrus white fly (see *Agricultural News*, Vol. XII, p. 398) the general results for the year under review were about the same as those reported in 1912. It has been further established, however, that moist weather conditions markedly increase the efficiency of the Microcera fungus. On the other hand, mere wetting of the leaves with water free from spores had no effect on the increase of Microcera. The following summary of the investigation is reproduced from the report in full:—

'1. Natural mortality of white fly is caused mostly by Microcera (Fusarium) as shown by:

'(a) The bodies of 98 per cent. of such natural mortality victims, or pieces thereof, yielded Microcera when grown in suitable culture media: 28 per cent. being pure colonies of Microcera.

'(b) No other fungus was obtained even half as frequently.

'(c) Except in very unfavourable weather, spraying with a suspension of the spores of Microcera caused a marked rise in the natural mortality. Microcera could always be recovered from these dead larvae.

'(d) Spraying or dipping with a suspension of spores from a pure culture on sweet potato caused fully as marked an effect as similar sprayings or dippings in a suspension of victims of natural mortality.

'(e) The period between spraying or dipping and the appearance of the marked increase in dead larvae corresponds closely with the time required for Microcera to develop in artificial media.

'2. It is possible, by spraying with Microcera, to increase natural mortality among white fly, but such increase is only temporary.

'3. Microcera grows best during periods of high humidity but not too high temperature.

'4. It is not as thorough in its work as the brown fungus or even the red Aschersonia; that is, it is less virulent.

'5. It acts much more quickly than either of the others.

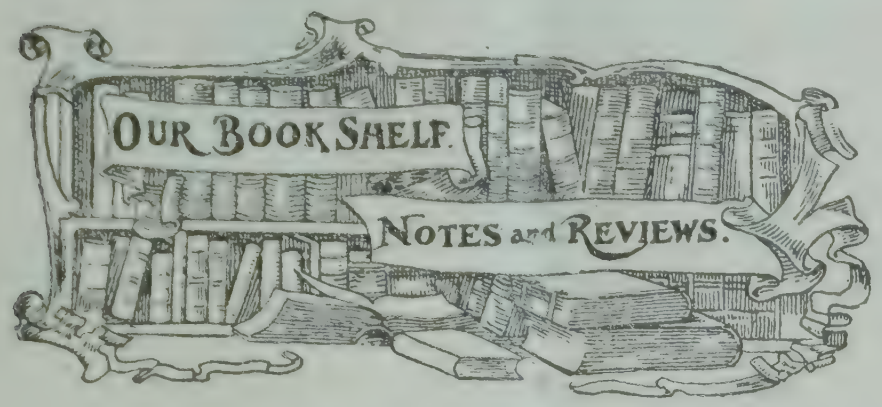
'6. It is so universally present in groves that spraying it alone into trees is not as important for the grower as it is to spray the red, and especially the brown fungi. Nevertheless, in spraying either the red or the brown fungus, it is an excellent idea to add Microcera.

'7. For spraying purposes artificial cultures of Microcera on sweet potatoes are to be preferred to the victims of natural mortality, because a much larger number of spores get in suspension from artificial culture.'

The last investigation of interest to the West Indies described in this report, is that dealing with Melanose, a malady which affects the leaves, stems, and fruits of nearly all varieties of citrus. It is caused by *Phomopsis citri*, Fawcett, and occurs in the West Indies. The results obtained as to the effect of fungicides in preventing Melanose infection are of some considerable importance. The following fungicides were used: (1) lime-sulphur, (2) Bordeaux mixture, (3) ammoniacal solution of copper carbonate. The first seemed to prevent infection completely, but caused more or less injury to the foliage by burning or scalding the edges of the leaves, or by producing yellowish blotches or spots on the surface. While Bordeaux mixture did not entirely prevent infection, the amount of spotting was so small as to be considered negligible. No injury to the foliage resulted from the use of Bordeaux mixture. In the case of the third fungicide there was some infection, but not enough to be worth considering from a practical point of view. In one of the experiments with ammoniacal copper carbonate there resulted a slight burning of the foliage.

In concluding this review, attention may be called to an announcement in the Report that scab of citrus became increasingly troublesome during the year. The disease here referred to was doubtless the new canker.

W. N.



PROCEEDINGS OF THE THIRD INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE. *John Bale Sons and Danielsson, Ltd.* London 1914. Price 10*s.* net.

This publication contains abstracts supplied by authors of the papers which were read at the Congress held in London last June. Reports of the discussions are also included. It is unnecessary to describe the contents more fully in this notice, since a large number of the abstracts have already appeared in the *Agricultural News*. Those interested generally in tropical agriculture, and particularly those desiring information on international progress concerning any particular crop, are strongly advised to procure a copy of these Proceedings. It is understood that a complete collection of the papers, *in extenso*, is soon to appear.

TIMBERS OF BRITISH GUIANA. By Herbert Stone and W. G. Freeman, B.Sc. Published by the *Government of British Guiana*, 1914. Price 5*s.* net.

This book consists of a technical report upon the collection of British Guiana woods, made by the Hon. A. G. Bell, for sometime Colonial Civil Engineer. The species from which many of the samples were obtained have not in some cases been identified owing to the difficulty of obtaining flowers. It might be suggested, too, that even when flowers of trees can be obtained, they are generally small and fragile, so as to make preservation, particularly under forest conditions, a matter of difficulty. Each description is divided into first, physical and economic characters including uses, qualities, etc., and secondly, anatomical characters. It would seem that the authors consider that a large number of the woods possess little economic value outside British Guiana. In putting forward this view, they will no doubt have borne in mind that many of their specimens were obtained from trees which had not attained a state of maturity. The book is essentially one for reference, and perusal of the volume inclines one to the view that the report will be found very useful for the purpose of enabling the student to recognize any one of the woods described, even though it may not afford him enough information to obtain the botanical name of the tree which produced it. It occurs to us that similar reports would be useful in regard to Dominica and British Honduras.

TRANSPIRATION AND THE ASCENT OF SAP IN PLANTS. By Henry H. Dixon, Sc.D., F.R.S., *Macmillan & Co., Ltd.*, London, 1914. Price 5*s.*

A short account of a notice of this book in *Nature* appeared in a recent number of the *Agricultural News*. It is now intended to supplement this reference with a short review of the book itself. The volume under consideration is one of Macmillan's Science Monographs, of which *The Cotton Plant in Egypt* (reviewed in these pages) is one of the companion volumes. The subject dealt with in the present treatise involves a problem of old standing. Several theories have been advanced with a view to explaining the ascent of sap in high trees, but none has been, up to the present, sufficiently adequate. This, the author shows, applies especially to the so-called vital theories. The essential chapter in the book under review is Chapter IV, in which is expounded the author's theory (first published about 1894) of cohesion as a cause—or perhaps more accurately, a condition—of the ascent of sap. This chapter criticising, as it does, previous hypotheses, is extremely interesting. The cohesion of water on which the cohesion theory is based is explained by means of a simple experiment, which shows that water in a J-tube from which air has been expelled, will remain suspended in the longer limb against gravity. It is shown in this way that the lower part of the water in the longer limb of the tube transmits a stress through the upper part of the glass, equivalent to its gravitational pull. In this way the author assumes that the water in the conducting tracks of high trees hangs there by virtue of cohesion, just in the same way as the water hangs in the experiment with the J-tube just described. This reminds us of Blackman's expression that transpiration is 'the winding up of ropes of water.'

Information in the book, hitherto unpublished in the author's previous papers, seems principally to be that which explains why empty vessels in the stems do not interfere with cohesion.

A large amount of data is given in the book concerning the tensile strength of sap, the osmotic pressure of the leaf, and thermo-electric cryoscopy.

W.R.D.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of January:—

GINGER, NUTMEGS, AND MACE.

In the matter of ginger there is nothing to report, except to say that business has been of a normal character. Nutmegs and mace were in good supply at the auction on January 20, when 450 packages of the former from the West Indies were offered and sold at the following rates: 58's, at 1*s.* 1*d.*; 63's to 72's, 5¾*d.* to 9*d.*; 74's to 85's, 4½*d.* to 7*d.*; 86's to 97's, 4¾*d.* to 6*d.*; 110's to 120's, 4¼*d.* to 4¾*d.*; and 134's to 144's, 3½*d.* to 4½*d.*: 99 packages of Eastern were also brought forward and partly sold, 65's fetching 9*d.*; 88's, 4½*d.*; and 116's to 125's, 1*d.* to 4¼*d.* At the same auction 80 packages of West Indian mace and 11 packages of Eastern were also offered, and sold, the former fetching 1*s.* to 1*s.* 10*d.* per lb., and the latter 1*s.* to 1*s.* 7*d.*

CITRIC ACID, LIME OIL, LIME JUICE, AND KOLA.

At the beginning of the month citric acid was quoted at from 2*s.* 6*d.* to 2*s.* 6½*d.* per lb., but a fortnight later it was slightly firmer, which position it retained to the end of the month. In the early part of the month, West Indian distilled lime oil realized from 2*s.* 10½*d.* to 3*s.* per lb., and for good bright hand pressed Dominica, 8*s.* 6*d.* was asked. At the close of the month fair West Indian distilled was offered at 2*s.* 6*d.*, and hand pressed, for which there has been but little demand, at 7*s.* 6*d.* Lime juice throughout the month has remained at 2*s.* 9*d.* for fair pale. Kola nuts have been in good supply, as many as 172 packages being offered at auction on the 13th, but 11 only were sold, 2¾*d.* per lb. being the price asked for medium Jamaica.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, February 23, 1915.

ARROWROOT—2*d.* to 4½*d.*
BALATA—Sheet, 2/3½; block, 1/11 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 80/- to 83/-, per cwt.; Grenada, 75/ to 78/6-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £27 to £27 10*s.* per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 12*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Quiet.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 2/4 to 2/9; concentrated, £21; Otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations
MACE—8*d.* to 2/11*d.*
NUTMEGS—4¼*d.* to 5¾*d.*
PIMENTO—Quiet.
RUBBER—Para, fine hard, 2/6; fine soft, 2/3; Castilloa, 1/11.
RUM—Jamaica, 2/3 to 2/6

New York.—Messrs. GILLESPIE BROS., & Co., July 24, 1914.

CACAO—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c.
COCO-NUTS—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
COFFEE—Jamaica, 9¾c. to 13½c. per lb.
GINGER—7½c. to 10c. per lb.
GOAT SKINS—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $2·50.
LIMES.—$3·75 to $4·50.
MACE—45c. to 53c. per lb.
NUTMEGS—110's, 11¾c.
ORANGES—Jamaica, $2·00 to $2·50.
PIMENTO—3⅞c. per lb.
SUGAR—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., February 22, 1915.

CACAO—Venezuelan, $16·00 to $16·25; Trinidad, $15·25 to $15·75.
COCO-NUT OIL—93c. per Imperial gallon.
COFFEE—Venezuelan, 11c. per lb.
COPRA—$4·10 to $4·30 per 100 lb.
DHAL—No quotations.
ONIONS—$4·25 to $4·50 per 100 lb.
PEAS, SPLIT—$9·00 to $9·50 per bag.
POTATOES—English $1·40 to $1·50 per 100 lb.
RICE—Yellow, $6·00 to $6·25; White $5·75 to $6·00 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. T. S. GARRAWAY & Co., March 8, 1915.

ARROWROOT—$4·00 to $4·50 per 100 lb.
CACAO—$13·00 per 100 lb.
COCO-NUTS—$16·80.
HAY—$1·75 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $82·00 per ton.
MOLASSES—No quotations.
ONIONS—$5·75 to $6·00 per 190 lb.
PEAS, SPLIT—$12·75 to $13·31; Canada, no quotations.
POTATOES—Nova Scotia, $3·25 per 160 lb.
RICE—Ballam, $6·10 to $6·25 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, no quotations.

British Guiana. Messrs. WIETING & RICHTER, February 6, 1915; Messrs. SANDBACH, PARKER & Co., February 19, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	14c. per lb.	14c. per lb.
CASSAVA—	$1·08	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$10 to $15 per M.	$18 per M.
COFFEE—Creole	——	16c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	16c. per lb.
Liberian	10c. per lb.	11c. per lb.
DHAL—	——	$6·40 per bag of 168 lb.
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	——
PEAS—Split	——	$11·50 to $12·00 per bag. (210 lb.)
Marseilles	——	——
PLANTAINS—	16c. to 40c.	——
POTATOES—Nova Scotia	$2·25 to $2·40	$2·25 to $2·40
Lisbon	——	——
POTATOES—Sweet, B'bados	$2·16	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
TANNIAS—	$2·16	——
YAMS—White	——	——
Buck	$2·04	——
SUGAR—Dark crystals	$3·40	$3·40
Yellow	$4·00 to $4·10	$4·00
White	$5·10 to $5·25	——
Molasses	$2·90	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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Origin of West Indian Economic Plants and Animals.

I.

IT is difficult to find anything more characteristically West Indian than the circumstance that nothing is indigenous. By considering the origin of cultivated and even wild plants, of domestic animals, and even man himself with his attendant culture, we readily discover that the great majority of forms were more or less recently introduced from abroad. In no other country is such a pronounced condition of affairs to be witnessed, and to designate the Lesser Antilles a 'land of exotics' would in no sense appear to be an exaggeration.

The information in this article has been selected principally to show the exotic origin of some of our most important crops, domestic animals, and pests. A consideration of the sources from, and agencies through which they have been obtained will form the subject of a later article.

Taking first the case of plants, we naturally commence by considering the origin of the sugar-cane. This plant is so classically a West Indian cultivation that many persons unconsciously regard it as indigenous. Botanically, this plant is a native of India or Southern Asia, that is to say, it has been found there growing wild. In the middle ages it was introduced by the Arabs into Egypt and Spain. Thence it was taken to the Canaries and Madeira whence it was introduced into Brazil in the sixteenth century. From Brazil it was brought to the West Indies about the middle of the seventeenth century, and from that time onwards has been the staple cultivation.

The economic plant in the West Indies which ranks next in importance after the sugar-cane is cacao. This plant, though a native of the New World, is not indigenous to the West Indies, though it is said to grow wild in Trinidad. Its original home is in the forests of the Amazon and Orinoco. This refers to the common species *Theobroma Cacao.* The other species are indigenous to various other parts of tropical America.

Considerable romance, in the West Indies, attaches to the name of Captain Bligh. This navigator was responsible for the introduction of the familiar bread-fruit tree. Commissioned at Mauritius (to which the

tree was brought from its native home in Java) Captain Bligh's first attempt failed owing to the mutiny of his crew, but the second voyage was successful, and in January 1793, he landed 153 plants in St. Vincent, whence the species has spread into most parts of tropical America.

An even more familar tree is the coco-nut palm. But this also is an exotic, although it may now be regarded as growing wild in most parts of the West Indies. The original home of the coco-nut was believed by de Candolle to be the Indian Archipelago. There can be no doubt that it was established on the continent of America long before it found its way to the West Indies. In connexion with this, the attention of the reader may be called to the United States' theory of the Central American origin of the coco-nut. This is supported by Willis, and is probably the correct origin.

We might continue to an almost unlimited extent, giving examples of exotic plants in the West Indies. Amongst vegetables, the yam and sweet potato are South American, and several important fruits like the banana and the lime came from Asia. As a matter of fact if one considers the geological age of the West Indian islands, which corresponds to the Pliocene of other countries —a comparatively recent formation— one realizes how limited has been the time for any evolutionary changes to produce an indigenous flora.

To show the extent to which introduced plants may take possession, reference may be made before concluding this section of our subject, to two Barbadian examples. These are the little yellow-flowered plant *Wedelia bumpthalmoides*, and the well-known Australian tree, Casuarina. The former, it is said, was introduced by a certain lady for her garden; but eventually some seeds escaped, and now this species forms characteristic 'carpets', having ousted several older inhabitants in the struggle for existence. Casuarina—the tree— has been equally successful in adapting itself to Barbadian conditions, and can be found growing in nearly every situation, on the coast as well as inland.

In a general way the West Indies may regard with satisfaction, their varied and valuable flora. In India during recent years there has been a tendency to attach less importance to the introduction of species. In the West, we cannot afford to adopt this attitude, first because of the strictly limited number of indigenous forms, and secondly, because we have for so long derived such immense benefit from introduced species.

Turning to the origin of domestic animals we learn that when the Spaniards first came to the Greater Antilles in the fifteenth century, they found no horses, and it is recorded that in subsequent voyages they brought out their own chargers. These were fine horses of Arab blood and may be supposed to be the original stock of Jamaica horses. Since that time up to the present, fresh introductions have been continuous both from America and Europe, and at present, although Jamaica must, of all the English islands, be regarded as the local stud, every colony has its strain of ponies well adapted to local conditions.

The cattle also are of exotic origin. Probably the Spaniards or the Portuguese are responsible for the original importations, but for the last century and a half animals belonging to the different English breeds have also been brought over in large numbers. These have principally been pure breeds, specimens of the Hereford, Red Poll, and Jersey breeds. The Zebu breed (*Bos indicus*) is a native of India. There exist many of these indigenous breeds of India—Mysores, Gir Hissar, etc.—all of which have during recent years been introduced through the enterprise of individual proprietors, and latterly through the enterprise of the Governments for the improvement of draft animals. The Red Poll—Zebu cross makes an excellent dual-purpose animal.

From the point of view of introduction, the most interesting animal in the West Indies is perhaps the Barbados woolless sheep. It is supposed to be of East African origin, and was certainly introduced before the middle of the seventeenth century. It has since been distributed through most of the islands. This animal produces mutton of good quality and can thrive under conditions which European breeds find themselves unsuited for. At the same time British representatives have from time to time been imported, a satisfactory breed for crossing being the Kent or Romney marsh animal.

The origin of goats, like that of poultry, is exotic. A recent introduction of interest in connexion with the latter is the high milk-yielding Toggenburg breed of Switzerland. Poultry are represented by several of the English breeds, and also by American (e.g. Rhode Island Red). The breed which seems best adopted naturally for the West Indies is the Leghorn, which originated in the countries of the Mediterranean.

When we come to consider the origin of insect pests and fungoid diseases we tread on rather specu-

lative ground. The subject is a very complex one and rather neglected, particularly as regards fungi. It is probable that many of the old established maladies were introduced with the plants and animals commonly affected. On the other hand, indigenous, or at least naturalized species of insects and fungi may have gradually become parasitic after the introduction of some particular cultivated plant or animal. It may be mentioned here that our views as to what a parasite is, have of late years undergone a change. We now realize that any insect which is not highly specialized to a saprophytic life, is liable to be a parasite, the governing factors being principally the activity of the natural enemies of the species, and the extent of its available food supply.

It is possible, however, to produce several definite examples of introduced pests and diseases. Among the scale insects at least twenty-five species have been introduced from outside the West Indies. Among boring insects there are several notable cases. The moth borer of the sugar-cane (*Diatrea saccharalis*) is probably a native of South America, whilst the giant moth borer (*Castnia licus*) was certainly introduced from that country. The longicorn beetle which was observed two years ago boring in mango and Avocado pear trees in Trinidad and St. Croix was identified as *Bartocera rubus*, which is a native of Asia and East Africa.

As regards natural enemies, an interesting introduction is the Mexican predaceous bug (*Castolus* sp.), which was brought to Trinidad as an enemy of the froghopper.

Turning to fungoid diseases, it is possible to give only two examples with any degree of certainty, because our knowledge of the exact distribution of species is so imperfect. It is likely that the fungus *Colletotrichum falcatum*, which causes Red rot of the sugar-cane, was imported from the East to the West Indies in cane cuttings. The principal reason for holding this view is that the disease broke out more or less suddenly long after sugar-cane had been grown in these islands as a principal crop. Another example of a still more definite kind is that of the Panama disease of banana, which occurs in Jamaica and Cuba. This is caused by a fungus (*Fusarium* sp.) which was certainly introduced from Central America.

On the basis of this information it will be evident that we have no reason to think that all our introductions concerning plants and animals have been entirely beneficial. When we come to consider the more insidious and fatal diseases of man and the domestic animals—yellow fever, anthrax, pyroplasmosis, etc.—we see that all the causative organisms must have been introduced in the blood of emigrants. Furthermore, in the case of yellow fever there appears to be evidence to show that the transmitter, the mosquito (*Stegomyia fasciata*), is not indigenous to Central America at all, but was brought over with the slaves from West Africa.

CACAO MANURIAL EXPERIMENTS, TRINIDAD.

The results of three years' trials on eight different estates have just been issued in tabular form by the Trinidad Department of Agriculture in their *Bulletin*, Vol. XIV, Part I (1915). The results recorded are of considerable interest, especially when considered in connexion with the Dominica experiments (see *West Indian Bulletin*, Vol. XIV). The weather conditions were very favourable for last year's trial, for although the rainfall was less than in the previous year, the precipitations were more evenly distributed, and the dry season preceding the crop was comparatively mild. All the plots showed a large increase over previous years, and the fundamental importance of a favourable season is seen at a glance at most of the diagrams facing the tables. This is obvious from the fact that the increase in crop over that of last year was in several cases as great in the no-manure or control plots as in those which had been treated with artifical fertilizers.

The diagrams indicate the average yield of pods per tree on twelve different plots each receiving different treatment, at least two being controls. In diagram I, it is seen that basic slag and sulphate of potash; and bone meal, sulphate of potash, sulphate of ammonia, and pen manure, gave the greatest return for 1913-14. In diagram II, which illustrates the experiments on Esperanto estate, bone meal, sulphate of potash and sulphate of ammonia produced the greatest effect. According to diagram III, the increases were more even in the case of all the treated plots with the exception of that receiving nitrogen only. In diagram IV the greatest return is shown to have been got from the application of bone meal and nitrate of soda. The next plate shows a very high all-round increase from manures. Diagram VI indicates the usefulness of superphosphate, sulphate of potash and nitrate of soda. The results on Santa Isabella estate, plotted in diagram VII, indicate clearly the increased yields produced by the application of mulch in connexion with potash. In the next diagram, No. VIII, sulphate of potash and sulphate of ammonia produced the greatest return.

Summarizing these observations, it would appear evident that the full effect of manurial treatment is never obtained unless the rainfall is favourable. The importance of nitrogenous and phosphatic manuring appears to be indicated, and there is reason to believe that in Trinidad as well as in Dominica the greatest benefit is obtained by the employment of mulch in conjunction with mineral manures.

In conclusion we may compliment the department on the clear way in which they have demonstrated by means of diagrams the results of their experiments for the years under review, and there can be no doubt that the report which forms the subject of this brief review will be found of much interest and value to cacao growers not only in Trinidad, but also in the West Indies generally.

INDIAN CORN.

KILN-DRYING IN ST VINCENT.

Government Scheme.

The Administrator of St. Vincent (the Honourable Gideon Murray) has caused the following announcement to be published in the Colony concerning the Kiln-drying of Indian corn:—

I desire to notify for the information of planters and peasant proprietors that arrangements have been made by the Government Cotton Ginnery in consultation with Dr. Watts, the Imperial Commissioner of Agriculture, to add to its plant the necessary machinery and appliances to shell and kiln-dry corn (maize), and that it is hoped that this machinery will be erected and ready for use by August 1 of this year. The advantage of kiln-dried corn is, that given proper storage conditions, it will keep indefinitely, and therefore finds a readier sale and a better price than corn which has only been sun-dried, and which quickly deteriorates in quality owing to the excessive amount of moisture retained in it. The markets for kiln-dried corn in Barbados and Trinidad together reach a figure of £12,000 per annum, whilst in addition, corn meal is imported into these two Colonies to the annual extent of £30,000. All this corn and corn meal is imported at present from the Argentine, and from the United States of America. In view of the fact that the soil and weather conditions in St. Vincent are pre-eminently suited for the growth of corn, it is right that this Colony should make a bold bid to secure a share of so lucrative a West Indian market, and one that is so close to its own shores.

Moreover, in St. Vincent itself, there is a market for this product, and with the price of flour constantly rising owing to the exigencies of the war, it is economically wise to foster an industry which can provide an effective substitute for that necessary article of food. With regard to corn seed, intending growers are advised to consult the Agricultural Superintendent.

I attach some instructive extracts from a report on certain experiments conducted recently in Antigua with the object of ascertaining the keeping qualities of kiln-dried corn as compared with sun-dried corn.*

Appended also is a copy of the rules under which corn will be received at the Government Cotton Ginnery as from August 1.

Rules concerning the drying and purchase of Indian corn.

Maize corn of first grade quality will be received at the Government Cotton Ginnery from August 1, 1915, under the following conditions:—

1. Corn will be bought on a profit-sharing basis as follows:—

(*a*) Not exceeding 7,000 lb. of corn on the cob or 50 bags of 112 lb. of shelled corn from any one person per crop, except with the special permission of the Governor. For sake of convenience, corn on the cob should be put up in bags weighing 100 lb.

(*b*) Lots in lesser quantities than 100 lb. of corn on the cob or 50 lb. of shelled corn will not be bought.

(*c*) Corn will be paid for at the rate of 3*s.* 4*d.* for every 100 lb. of first grade corn on the cob or $\frac{1}{2}d.$ per lb. for shelled corn. This price is subject to market fluctuations. Corn is high at present.

(*d*) Any profits, after paying all expenses will be divided by way of bonus, $\frac{3}{4}$ to sellers and $\frac{1}{4}$ to Ginnery.

(*e*) All corn brought for sale on the profit-sharing system must be clean, sound, and sun-dried. Corn on the cob must have the husk removed. *Second Grade corn will not be accepted under any conditions.*

2. (*a*) Corn will also be received at the Ginnery for shelling and drying at a charge of $4\frac{1}{2}d.$ for every bushel of 56 lb. returned to the sender, and

(*b*) Shelled corn received for drying only will be charged for at the rate of 4*d.* a bushel of 56 lb.

Payment must be made by the sender before delivery by the Ginnery.

(*c*) Senders must provide their own bags.

(*d*) A notice of intention to send corn for shelling and drying or for drying only must be given not less than two weeks in advance, *and corn will only be accepted by arrangement with the Manager within the capacity of the machinery.*

(*e*) Corn will not be stored after drying for more than two days.

* Omitted: See *Agricultural News*, Vol. XIV, pp. 53 and 75.

CORN-MEAL BREAD.

The following recipes for cooking corn meal in the form of bread are reproduced from *Farmers' Bulletin*, No. 565, in continuation of those given in the previous issue of the *Agricultural News* from the same source, for corn-meal mush and cous-cous. It should be pointed out that it is difficult, if not impossible, to make a good yeast bread out of corn-meal alone, as is the case with wheat. This is due to the absence, in corn-meal, of 'gluten', which is the chief proteid of wheat.

Gluten, it may be explained, is a mixture of substances which, when combined with water, makes a peculiar sticky and tenacious mass that tends to hold any gas which is introduced into it. It is because of the presence of gluten that it is possible to make a porous loaf out of wheat flour and water. The protein of corn, on the other hand, is totally lacking in the quality of tenacity, and so the somewhat granular particles of meal tend to separate readily. Hence, in making corn-meal bread or cakes, if eggs are not used with the meal, it is necessary that a certain amount of wheat flour be introduced, if the bread is to be light and porous. Ordinary wheat flour is very commonly used for this purpose, but in the tests which were made in preparing the Bulletin from which the recipes given below are abstracted, the best results were said to be obtained with gluten flour, which is made from wheat by removing a certain amount of starch, and in which the percentage of gluten is high.

Corn-meal breads fall practically into three classes: those raised by air beaten into them, those raised by baking powder or soda, and those raised by yeast. The first are best made from the coarser meals and are usually very simple in character, often containing nothing more than meal, salt, and either water or milk. A small amount of fat or butter, however, is sometimes added. In breads of the second class the gluten deficiency of the corn is made up for by the use of eggs; while in those of the third class, the deficiency is supplied by the addition of some other flour, usually wheat or rye.

In the following will be found recipes for breads of each class:—

CRISP CORN-MEAL CAKE.

1 cup milk. One-half teaspoon salt.
One-half cup white corn meal.

Mix the ingredients and heat slowly until the boiling point is reached. It is not necessary to stir. Spread on a shallow buttered pan to a depth of about $\frac{1}{4}$-inch. Bake in a moderate oven until crisp.

PARCHED CORN-MEAL BISCUITS.

1 cup yellow corn meal. 2 cups peanut cream.
2 teaspoons salt.

Put the meal into a shallow pan and heat in the oven until it is a delicate brown, stiring frequently. Make the nut cream by mixing peanut butter with cold water and heating. It should be the consistency of thick cream. While the nut cream is hot, stir in the corn meal, which should also be hot. Beat thoroughly. The mixture should be of such consistency that it can be dropped from a spoon. Bake in small cakes on a greased pan.

If preferred, these biscuits may be made with cream or with butter in place of peanut cream, and chopped raisins may be added, 1 cup being the allowance for the quantities given above.

BEATEN CORN BREAD.

Three fourths cup white corn meal. One-half teaspoon salt.
Three-fourths cup wheat flour. 1 tablespoon lard.
1 teaspoon sugar. Water.

Mix and sift the dry ingredients and rub the lard thoroughly into the mixture by means of a fork. Add a little water, enough to moisten the mixture throughout, but not too much, as it must be crumbly. Spread on a board and beat thoroughly with a rolling pin or mallet, as is done with beaten biscuits, folding it over frequently to introduce air. Roll out about one-half inch thick, cut into small pieces, and bake in a moderate oven. In camp this can be baked in a hot greased pan propped up before a hot fire.

CORN-MEAL MUFFINS.

One-half cup corn meal. 1 tablespoon melted butter.
1 cup flour. 1 teaspoon salt.
3 teaspoons baking powder. Three-fourths cup milk.
2 tablespoons sugar. 1 egg.

Mix and sift the dry ingredients; add the milk gradually, the egg well beaten, and the melted butter; bake in a hot oven in buttered gem pans twenty-five minutes.

SOFT CORN BREAD.

Two-thirds cup rice. 2 or 3 eggs.
One-half cup white corn-meal. 2 tablespoons butter.
3 cups milk or milk and water mixed. 1 teaspoon salt.

Mix the rice, meal, and salt with the milk in the top of a double boiler, and cook until the rice is nearly soft. Add the butter and the eggs well beaten and transfer to a greased granite baking pan. Bake in a moderate oven for an hour. Serve in the dish in which it is baked.

DELICATE SPOON CORN BREAD.

One-fourth cup corn-meal. 1 teaspoon salt.
1 teaspoon butter. 2 eggs.
1 tablespoon sugar. 2 cups milk.

Mix the corn meal and water and bring slowly to the boiling point and cook a few minutes. Add the butter, sugar, salt and yolks of eggs. Lastly, fold in the whites of eggs beaten stiff. Bake in a hot oven thirty-minutes. Serve in the dish in which it is cooked.

BOSTON BROWN BREAD WITH CREAM.

1 cup rye meal. 1 half-cup molasses.
1 cup corn meal. 2 eggs.
1 teaspoon salt. $1\frac{1}{4}$ cups thin cream.

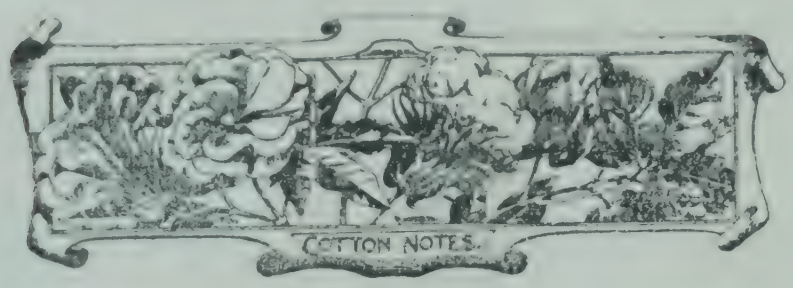
Sift the dry ingredients. Add molasses, yolks of eggs well beaten, and cream; lastly, fold in the whites of eggs beaten stiff. Pour mixture into buttered mold, steam three hours; then bake one hour in a moderate oven.

INDUSTRIAL USES OF CORN.

The original communications of the Eighth International Congress of Applied Chemistry, Section VIa, dealing with starch, cellulose and paper, contained two articles of interest on Indian corn. The first one, by Mr. H. C. Humphrey deals with the influence of by-products upon the development of the industry of corn products. In this is shown historically the steps which have been taken in the utilization of every portion of the kernel. A diagram is included which indicates the constitution of the corn kernel, and the nature of the substances which are manufactured from it. From the oil, cake and corn oil are produced; the endosperm consisting of starch and gluten is the source of a large number of different commercial carbohydrates. These include numerous syrups and sugars, dextrins and dry starches for various purposes, such as laundry work, confectionery and brewing. The gluten mixed with the corn-solubles (the solution remaining after corn has been steeped in water) is mixed with the hull to form the well-known gluten feed for cattle. From this it will be seen how important is the position of Indian corn in several industries, especially in the United States. This means that as these industries develop the demand for the raw material will be greater, resulting in a higher level of prices. Hence the desirability of the West Indies becoming less dependent upon North America for its requirements in connexion with this crop.

The next paper to which reference will be made is by Professor Louie Smith, and deals with the breeding of maize for industrial purposes. This is not a new subject, but it is worth re-calling attention to, in view of the fact that corn selection will probably form a part of the experimental work of the agricultural departments of the West Indies in the near future. The essential feature of the chemical selection of Indian corn is to obtain grain having a composition in accordance with what it is to be used for. Grain with a low protein content means, of course, a high starch content, and in such a corn we should have theoretically a kind well adapted for distilling purposes. A strain with a high oil content is valuable for the glucose and allied industries, in which the oil output forms such an important product. A low oil strain is of advantage in feeding pigs, because it produces the finest quality of bacon and lard. This latter point is of direct interest in the West Indies.

In conclusion, to give some idea of the extent to which the composition of corn can be altered by selection, it may be stated that breeding has produced in the high oil strain a kind of corn which contains almost $1\frac{1}{2}$lb. per bushel more oil than exists in average corn, while, on the other hand, breeding for low oil has caused a reduction in this constituent amounting to about $1\frac{1}{8}$lb. per bushel. It will be seen that the corn grain is very plastic in this respect, and it will no doubt be worth while to decide at an early date what kind of albuminoid ratio should be aimed at in regard to corn grown in the West Indies for human and animal consumption.



COTTON.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended March 6, is as follows:—

The sales of the week consisted principally of odd bags and Planters' crops classing Fine to Fully Fine on a basis of Fine 22c., the buying being on account of the Northern Mills, who were induced to supply a portion of their wants here, finding our market for Islands relatively cheaper than the prices now ruling for Georgias and Floridas. There is some demand for the Planters' crops classing Extra Fine and above, but at prices several cents below the views of Factors.

We quote, viz:—

Extra Fine 23c. to 24c. = 14*d.* to 14½*d.*, c.i.f. & 5 per cent.
Fine to Fully Fine 22c. = 13½*d.*, " " " "
Fine, off in colour 18c. to 20c. = 11½*d.* to 12½*d.* c.i.f. and 5 per cent.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, and Manchester, up to March 6, 1915, were 103 and 1,287 bales, respectively.

Cotton Ordinance, Montserrat.—On May 15, 1914, the acting Governor of the Leeward Islands assented to an Ordinance to regulate the planting of cotton. It was provided that there should be a close season for planting between September 1 and March 31 of each year. It has been found, however, that in certain districts of Montserrat earlier planting is desirable, and the Governor on the representation of certain planters and the Curator, has sanctioned the planting of cotton from March 20. This amendment was possible by virtue of Section 4 in the Ordinance, which provides that dates may be changed by Proclamation. It seems not unlikely that advantage may have to be taken each year of the facilities given by this section, which has been introduced, for this reason, into most of the West Indian cotton Ordinances.

DEPARTMENT NEWS.

Mr. C. B. Williams, B.A. (Cantab.), Entomologist to the John Innes Horticultural Institute of London under Professor Bateson, left Barbados on March 24, 1915, for Trinidad, after spending a week with this Department for purposes of study. Mr. Williams had previously made a six months' tour in the United States seeing the work of the Bureau of Entomology. After his visit to Trinidad, Mr. Williams proceeds to England *via* New York.

WEST INDIAN FRUIT.

CHANGES IN THE RIPENING BANANA.

A paper of great interest on the changes in composition of peel and pulp of ripening bananas is contributed to the *Journal of Agricultural Research*, Vol. III, No. 3. In this it is pointed out that previous analyses of the banana have been expressed in terms of the percentage of the pulp of the fruit. Since during ripening the peel continuously loses weight while that of the pulp steadily increases, such analyses are shown by the present paper to have a constantly shifting basis.

Four ripening experiments were made by the author: in two experiments, bunches were ripened in a respiration calorimeter designed for experiments with man. In the third and fourth experiments, uniformity in different bunches and the rate of starch hydrolysis were studied. The final conclusions arrived at were that the usual carbohydrate changes take place; that the most rapid respiration corresponds with the most rapid starch hydrolysis; that ash, protein, and ether extract undergo little alteration; that pentosans decrease rapidly in the pulp but little in the peel; and, what is most important, that analyses of peel and pulp show a steady transfer of water from peel to pulp during ripening. The author (Mr. H. C. Gore) discusses his results as follows:—

As the result of the foregoing studies, the author is in a position to state more exactly than has heretofore been possible, the nature and extent of the changes in the composition of bananas during ripening. The most conspicuous change is the long-recognized conversion of starch into sugars. It is most rapid while the fruits are turning from green to yellow. During this period the respiration rate increases many fold, becoming greatest at the time when the rate of starch hydrolysis is most rapid. Starch hydrolysis then gradually slackens, later ceasing altogether. The respiration rate, too, becomes slower, but still remains far more active than in the green fruit. Next to the starch and respiration changes, most conspicuous are those of water. The peel loses, while the pulp gains water steadily. The respective losses and gains in water of the peel and the pulp on ripening, expressed in terms of the original green bananas, are summarized. . . .

In the first, second and fourth experiments it is possible to show how much water is formed or absorbed by the pulp in physiological processes. The water formed in respiration can easily be calculated if formed in consequence of the complete combustion of carbohydrates, and if the amount of carbon dioxid evolved in ripening in consequence of this combustion is known. The respiratory quotient and the thermal quotient determined by the Office of Nutrition Investigations for ripening bananas (16) agree in showing that the carbon dioxid evolved on normal ripening is due solely to the complete combustion of carbohydrates. We are therefore justified in calculating the water formed by the equation $C_6H_{12}O_6 + 6O_2 = 6CO_2 + 6H_2O$. From the water so formed is subtracted the water absorbed in the saccharification of starch. . . . In the first two experiments absorption of water amounting to 0·782 and 0·512 per cent. occurred as a net result of respiration and starch hydrolysis. In the fourth experiment, where the bananas became over-

ripe, the water formed in respiration was greater by 0·195 per cent. than that absorbed in starch hydrolysis.

The increases of water in the pulp during ripening are all derived from the peel, except when bananas become overripe, when the water formed in respiration may more than balance the water absorbed in starch hydrolysis. From the quantity of sugar formed in the pulp it is evident that the osmotic pressure of the pulp must undergo a marked increase, with a corresponding decrease of vapour pressure, during the ripening of the fruit. A possible operating cause of the water transfer from peel to pulp is obvious.

From a knowledge of the carbon dioxid formed in respiration and knowing from the calorimeter data that carbon dioxid results from the complete combustion of carbohydrates, it can be determined whether or not the carbohydrates consumed in respiration were accurately made known from the analyses. Carbohydrate losses found by analysis contrasted with the expected losses from the calorimeter data are shown.

By analysis somewhat greater losses appear than indicated from the calorimeter data. It is not improbable that the small differences are due to analytical error.

FEEDING AND MANURIAL VALUE OF LIME SEEDS.

Dr. H. A. Tempany has forwarded from Antigua some interesting notes on the feeding and manurial value of lime seeds, which will be reproduced *in extenso* in the *West Indian Bulletin*. The matters dealt with, however, are of sufficient general interest and importance to make it desirable to publish at once an abstract of the main observations in the *Agricultural News*. These are included in the present article.

In lime-growing districts it is the custom to dispose of skins and pulp containing seed, by placing them in cattle pens, or throwing them on one side as waste material. It appeared interesting to know what the manurial and feeding value of these seeds were, and especially the nature and amount of the oil. On analysing samples at the Government Laboratory it was found that dried seeds contained nitrogen, 1·11 per cent.; phosphoric acid, 0·58 per cent.; potash, 0·353 per cent.; and moisture. 9·30 per cent. From the point of view of manurial constituents, the material is less valuable than the majority of seeds. On the Barbados scale for the valuation of manures it is worth $3·29 per ton.

As regards feeding value, the albuminoid ratio on crude protein is 1:15·5. The seed is therefore deficient in protein but rich in carbohydrates. The most noteworthy feature of the analysis lies in the high content of oil, amounting to 34·44 per cent.

The constants of this oil have been determined, and certain of its qualitative characters described. These matters will be dealt with fully in the *West Indian Bulletin*. It may be stated here, however, that the oil is a rather dark, yellow, viscous fluid, of about the consistency of olive oil. When separated, the oil possesses a very pronounced bitter taste. This appears to be due to some bitter alkaloid or glucoside contained in the seed, which is dissolved out in the chloroform. The oil can be freed from it by washing with alcoholic hydrochloric acid. The oil does not appear to possess any drying properties; a comparison with other oils seems to indicate that, in general character, it somewhat resembles the oils of the rape oil and cotton seed oil groups, and might find application as a lubricant, or in soap-making, and if the bitter flavour referred to were removed, possibly as a substitute for olive oil.

It seems possible that if the oil were expressed by pressure instead of extraction by solvents, the bitter flavour would not be so pronounced. On the other hand, the pressure of such a bitter component in the pressed cake would no doubt impair the value of this for feeding purposes. In order to enable comparison to be made with other press cakes, the manurial value has been recalculated by Dr. Tempany on the assumption that the oil content has been reduced to 6 per cent. From the figures obtained, it appears that such a press cake would on the Barbados scale for the valuation of manures be worth $4·50 per ton.

In connexion with these interesting observations, Mr. Joseph Jones, Curator of the Botanic Gardens, Dominica, forwards a note on the extent of the production of lime seeds in that Colony. He says, taking the Dominica lime crop for 1914 at 388,000 barrels of fruit, and allowing for the shipment of 46,000 barrels of fresh and pickled limes, the production of seed at $2\frac{3}{4}$ lb. per barrel of limes would amount to 470 metric tons.

West Indian Ground Nuts.—The Curator of the Experiment Station, Montserrat, writes to this Office to say that it is intended to send samples of three varieties of ground nuts in cultivation in Montserrat, namely, Virginia Running, Gambia, and Rufisque, to the Imperial Institute for report and valuation. The Curator calls attention to an article which appeared in the *Agricultural News* (Vol. XIII, p. 339), in which it was stated that it is necessary for the nuts to be shelled in order that ready sales may be effected in the English and French markets. In accordance with this it is intended to send shelled nuts for examination.

In the *Morning Post* for February 6, 1915, a short article refers to the efforts that are being made by the Imperial Institute to create a market in the United Kingdom for ground nuts grown in India and West Africa (Gambia and Nigeria), since on the outbreak of war the cessation of trade with Germany and the great diminution of the French demand have placed producers in a serious position.

The sending of samples from Montserrat is therefore opportune, since it is in alignment with a policy which is being pursued officially in Great Britain. It is not likely, however, that the prices for ground nuts and their products will be high for some time, and it is probable that producers on a large scale in India and Africa will be able to more than supply requirements at a lower price than would pay the West Indian producer. In this connexion it may be of interest to refer to a letter received by the Imperial Commissioner of Agriculture for the West Indies from His Excellency the Governor of Gambia, in which it is stated that the price of ground nuts at the time of writing had fallen so low as to cause embarrassment, the price being only a small fraction of what it is in normal years. The Gambian crop, moreover, was large. This does not look encouraging for any development of the industry in Montserrat at the moment, unless the Imperial Institute can find a special opening.

The Report of the Land Officer, Grenada, for the month of February 1915, states that the cane crop looks promising and that a splendid crop of pigeon peas has been reaped this season on the small holdings. Bush land is being cleared for the next corn-planting season. Road improvement continues.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number discusses the origin of West Indian economic plants and animals. The subject will be continued in the next issue in regard to the sources from, and agencies through which economic forms are obtained.

A large amount of information on Indian corn appears on pages 100 and 101.

Fruit articles will be found on pages 102 and 103.

Insect and Fungus Notes, which appear on pages 106 and 110, deal with a pest of the papaw and the efficiency of fungoid parasites, respectively.

A very interesting article on radium and plant growth will be found on page 111.

Index to the 'Agricultural News'.

With this number of the *Agricultural News* is published, as a supplement, the index to Volume XIII. This may be bound at once in the usual manner with numbers 305 to 330, of which Volume XIII is comprised.

The index should prove useful for purposes of reference on all matters relating to tropical agriculture, and will be of value as a guide to concise information on insect pests and fungus diseases of tropical cultivated plants.

West Indian Bulletin.

The recently issued number of the *West Indian Bulletin* (Vol. XIV, No. 4) contains an exceptionally intereresting collection of articles. New movements and developments are represented by a paper by Dr. Francis Watts, C.M.G., on the suggested production of pork and bacon in these islands on co-operative lines, and by two useful articles having relation to the developing sugar industry by the same writer and by Nöel Deerr. Cotton receives attention by John McConnel in the form of a paper indicating the importance of commerce and science in regard to cultivation, and also in another by W. Nowell, Mycologist to the Imperial Department, on some West Indian physiological affections of that crop. This latter paper contains a summary of the work that has been done in connexion with this difficult subject in other parts of the Tropics.

The important question of Antigua's water-supply is treated scientifically in two papers by Dr. Wayland Vaughan, of the U.S. Geological Survey, and Dr. H. A Tempany, Superintendent of Agriculture and Government Chemist for the Leeward Islands, respectively; whilst the Land Officer's Report on the Land Settlement Scheme in St. Lucia will prove of much interest to those who are acquainted with the Settlement movement in Grenada, St. Vincent and elsewhere

The index to Vololume XIV, of which the present issue constitutes the last number, will be sent out with Volume XV, No. 1.

Cotton Expert's Tour in the West Indies.

Mention was made in the *Agricultural News* for November 21, 1914, of the prospect of a visit to the West Indies, by Mr. J. L. Fonda, the Cotton Expert representing the Fine Spinners and Doublers Association, Limited, of Manchester. Mr. Fonda arrived at Barbados on November 20, and after arranging, in consultation with the Imperial Commissioner of Agriculture, an itinerary of the proposed tour to visit cotton centres in the West Indies, he proceeded to the Leeward Islands per C.R.M.S. 'Chaudiere', arriving at St Kitts on December 6, where he remained until December 14, on which date he went to Nevis. In each of these islands Mr. Fonda attended a meeting of representative cotton growers, held under the auspices of the Agricultural and Commercial Society. Leaving Nevis, Mr. Fonda arrived at Montserrat on December 19, where he remained until January 1, 1915, on which date he proceeded per C.R.M.S. 'Chaleur' to Antigua,

arriving there on January 2 and remaining till the 10th. Here a conference was held with the Directors of the Antigua Cotton Factory, Limited, as the result of which a memorandum outlining certain disabilities attending the cotton industry in Antigua was presented to Mr. Fonda.

Returning to Barbados from Antigua on January 11, per C.R.M.S. 'Chaudeire', Mr. Fonda proceeded to Trinidad on January 12 , and thence to Tobago, returning to Barbados on January 25, where he remained to January 27. During this visit he attended a special meeting of the Barbados Agricultural Society held on the 26th. Mr. Fonda left Barbados for St. Vincent on January 27, arriving at the latter place on the 28th. Here he remained until February 7, and during this visit attended a meeting of local cotton growers, with whom cotton cultivation, and the market situation were discussed. From St. Vincent Mr. Fonda returned to Barbados on the 7th, and proceeded on the same date by the Q.S.S. 'Korona', to St. Croix, whence it was his intention to return to England direct, or *via* New York, pending steamship opportunities.

The results of Mr. Fonda's visit will be published as soon as the information has been supplied by his Principals.

German Potash.

The United States has perhaps more than any other country felt the cessation of supplies of potassic manures from Germany, and a good deal has been written lately in America on the local manufacture of potash salts to take the place of the fertilizers which ordinarily come from Strassfurt. The proposed manufacture includes the production of potash from felspar, and also the production of potash from sea kelp. Reference to these two industries has already been made in the *Agricultural News*. According to recent information in the *American Fertilizer*, chemical engineers are dubious as to the success which it is hoped will attend the extension of these two industries. Concerning felspar, much depends upon the production of by-products as well as the potash. In the case of the sea kelp industry, the American press points out the need for further investigation and commercial experimentation. It should be stated, however, that a company already exists in California, and considerable tracts of sea-board have been taken over with a view to the collection of kelp, and the manufacture of potassic manures from it.

At the present time there is of course no possibility of shipment of any potash whatsoever from Germany, owing to the complete stoppage of the sea trade. It is instructive however to consider briefly the principal features of the German-American potash relationship during the past few months. The German Government prohibited the export of all potash salts after January 29. This led to the formation of a committee in Berlin, with the object of placing proposals before the Government in regard to the denaturizing of potash salts so that they would be useless in the manufacture of explosives, while remaining valuable for purposes of manuring. Towards the end of February, the United States Government issued an announcement that the German Government had agreed to allow the export of kainit, a salt containing less than 20 per cent. of potash. Consumers in New York accordingly attempted to place themselves in communication with the American offices of the Potash Syndicate, with a view to securing supplies of kainit. The remarkable fact is, that although that office had been in communication with the head office at Berlin, it had received up to March 4 no announcement, whatsoever to the effect that a lifting of the embargo had been permitted by the German Government and the obvious conclusion is that the embargo never had been lifted.

Potash Deposits in Spain.

The *Agricultural News* was one of the first journals to deal with the question of the war's effect upon the supply of potash, and a comprehensive note on the subject appeared in the issue for September 12, 1915. To the sources there referred to as existing outside Strassfurt, we can now, according to the *Chamber of Commerce Journal* (London, February 1915), add that of Servia, south of Cordova, in Cataluna, Spain. Here potash mines have been worked for some years, but it is believed that the deposits have by no means been thoroughly exploited. The Government of Spain, with the assistance of the Geological Institute of that country, is said to be making reservations for a technical survey. It is believed that there will be some difficulty in arriving at an accurate estimate as to the extent of the potash beds because the salt does not lie in a regular basin as in upper Alsace and at Strassfurt. A Spanish mining engineer has stated that an appreciable amount of capital will be required to make the necessary survey, but that the chances for finding potash in remunerative export quantities are favourable.

Composition of Beans and Peas.

In view of the new interest which is being taken in the cultivation of food crops, especially beans, in the West Indies, the table of analysis of different species of leguminous plants grown in German East Africa, and published in the *Bulletin of the Bureau of Agricultural Intelligence and Plant Diseases* (August-October 1911) should be of interest. The composition of five different species of Phaseolus is given, also that of the pigeon pea (*Cajanus indicus*), the lablab bean (*Dolichos Lablab*), *Vigna catjang*, *Canavalia ensiformis*, and *Voandzeia subterranea* (Anjola pea). As a general rule the Phaseolus species seems to be less rich in protein than the other beans, though the percentage of crude fibre is greater in the case of the others. *Vigna catjang*, of which fourteen varieties were analysed, showed considerable variation in composition, the fat, for instance, varying between 0·86 and 4·33. As a general rule these beans and peas contain about 88 per cent. of dry matter, of which about 50 per cent. is digestible carbohydrate.

It is perhaps unnecessary to point out that beans constitute the most concentrated foodstuff which the farmer grows. Indian corn possesses many advantages, but beans are better from the point of view that they contain a higher percentage of nitrogenous matter.

INSECT NOTES.

A FRUIT FLY ATTACKING PAPAW FRUITS.

The *Journal of Agricultural Research* for September 21, 1914, published by the U.S. Department of Agriculture, contains an article entitled Papaya Fruit Fly. The Papaya of the Southern United States is the West Indian Papaw (*Carica papaya*), and as this plant has some importance from an economic point of view, in certain of these islands, a brief abstract of the paper mentioned above, which appears under the joint authorship of Messrs. Frederick Knab and W. W. Yothers, may be of interest to readers of the *Agricultural News*.

The insect which forms the subject of this paper is *Toxotrypana curvicauda*, Gerstaecker. It was first brought to the notice of the U.S. Department of Agriculture in 1905, when it was bred from a maggot-infested papaw fruit, from the Subtropical Plant Introduction Field Station at Miami, Florida. Since that time, the increasing importance of the papaw as a possible commercial crop has led to investigations in connexion with this insect.

The papaw fruit fly is now recorded as occurring in the southern part of Florida, in Costa Rica, Yucatan, Brazil, Peru, Porto Rico, Bahamas, and St. Jean (? St. Jan) Danish West Indies. It is stated that this last record has been erroneously given as St. John, Antigua.

DESCRIPTION—THE ADULT. The papaw fruit fly (*Toxotrypana curvicauda*) belongs to the dipterous family Trypetidae and exhibits a certain superficial resemblance to a common brown wasp (Polistes). This is due not only to its similarity of size, form, and general colouration, but in life this is accentuated by the manner in which it walks about on the fruit, with its body well elevated upon its slender legs, and by a certain nervousness of movement. The female is remarkable for its long and slender curved ovipositor, which exceeds the length of its body.

THE EGG. The eggs were procured from gravid females by dissection. The number of eggs produced by a single female appears to be slightly in excess of 100; the counts from two females, both showing a distended abdomen and probably containing a nearly full complement of eggs, gave 103 fully developed eggs in each case. No eggs in process of development were present, which indicates that all the eggs are disposed of within a short period.

THE LARVA. The larvae are shining, dirty, greenish white in colour while feeding upon the interior seed mass. Larvae that have matured within the ripened fruit, and that have penetrated into the meat, are the same rich golden-yellow colour as the ripe fruit.

HABITS OF THE LARVAE. The larvae of the papaw fruit fly occur in the interior of the fruit, first feeding in the central seed mass, but later, as they mature and the fruit ripens, working into the meat and ruining the fruit. The number of larvae in a single fruit varies from two or three to twenty or more. Sometimes larvae of different sizes occur in the same fruit at the same time, showing that the infestation was from more than one oviposition.

Cultivated fruit has been found to be generally less infested than that growing wild, and this is ascribed to the fact that the flesh of the cultivated fruits is usually thicker, the thin-fleshed varieties appearing to be more generally attacked. It seems that the eggs are deposited inside the seed cavity, or at least the insects develop best when this happens. Thick-fleshed fruits often showed numerous scars, indicating attemps at oviposition, when no injury to the seed mass or the flesh occurred to indicate the feeding of the larvae. On the other hand, fruits were noticed, in which fully grown larvae were found dead. This is explained as being the result of an attack on fruits which were too young. The contact with the juice of the unripe fruit is quickly fatal to the larvae. It is evident that the fruit was too young when attacked, and that the maggots became fully grown and attempted to penetrate into the flesh before it was sufficiently ripened, and they were killed by contact with the juice. In the ripe fruit the flesh is softer, and the gummy juice is no longer exuded.

PUPAL PERIOD. The larvae when full-grown usually leave the fruit and fall to the ground, where they pupate, under some bit of rock or buried in the soil at a depth of one or 2 inches.

The length of the pupal period is given as seventeen to twenty-one days in Porto Rico, and from thirty to forty-two days in Florida. The latter figures were obtained as the result of observations in the cool season of the year.

HABITS OF THE ADULT AND OVIPOSITION. The adults of this species appear only for a short time just before sunset. A female fly was observed to alight on a well developed but unripe fruit. After walking about a little she inserted the ovipositor its full length into the fruit. As soon as the rind was punctured, the milky juice which the unripe fruit exudes whenever injured welled forth and began to trickle down over the surface. It is evident that the female fly endeavours to thrust her ovipositor through the flesh to deposit the eggs in the central seed cavity, and that it is only in those varieties with the thinner-fleshed fruit that this is successfully accomplished. The larvae are always found in the seed mass, except when they are full-grown and the fruit is ripe, when they penetrate into the flesh with the object of working their way to the outside in order to get to the ground and pupate.

FOOD PLANTS. Up to the present time no other fruit than the papaw has been recorded as being attacked by this insect, and all attempts to introduce the larvae to feed on other fruits have, so far, failed.

RAPID INCREASE OF THE FRUIT FLY. During the last two years the papaw fruit fly has rapidly increased in abundance, and has extended its range so as to threaten seriously the future development of the papaw industry in Florida. This is largely a result of the increased cultivation of the papaw in the southern part of the State. Some varieties of Philippine stock producing large fruits are apparently free from attack.

CONTROL. It has been pointed out that fruit with very thick meat escapes infestation. While the papaw fruit fly attempts to oviposit on such fruit, the thickness of the meat prevents the tip of the ovipositor from reaching the seed cavity, and in the meat itself, the larvae cannot live. It was further found that in some fruits the larvae had reached maturity before these had ripened, and had been killed by the sticky juice of the green fruit in endeavouring to escape. The means of control that now seem valuable are the production of varieties of papaw that have thick meat and that ripen slowly and, the conscientious destruction of adventitious or wild papaw plants, and of all infested fruits. All plants with inferior fruit should be eliminated.

H.A.T.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. The Agricultural Superintendent (Mr. W. N. Sands) writes to say that work in the Experiment Station during February has included principally operations connected with provision crops. The harvesting has begun of onions, sweet potatoes, Rounceval beans, white velvet beans, and Bengal beans. This reflects the importance which the cultivation of such crops is likely to assume in the Colony. In the Gardens, a large number of imported coco-nuts were inspected, and 900 cane cuttings distributed. As regards the condition of the principal crops in the island, thrips are attacking cacao in some places, and the prices for cotton and arrowroot are still depressed.

Mr. Sands states that the installation of an 'oil expeller' and other machinery for dealing with cotton seed has been in progress at the Government Ginnery. An article on another page of this issue will show that important developments are pending in regard to the handling, on co-operative lines, of Indian corn.

It is recorded that Mr. J. L. Fonda representing the Fine Spinners' Association, and the Imperial Commissioner of Agriculture, visited the island during the month. Dr. Watts left on the 7th instant. The rainfall at the Botanic and Experiment Station for the month was 1·79 and 1·59 inches, respectively. The weather was therefore dry.

ST. LUCIA. According to the report of the Agricultural Superintendent (Mr. A. J. Brooks), work in the Experiment Station has included various operations connected with citrus cultivation, including the raising of lime plants and the budding of oranges and grape-fruit. Considerable efforts are being made to improve the Castries Botanic Gardens.

Observations relating to the conditions of crops show that the lime crop was practically over, while the cacao was coming in slowly. The reaping of sugar-cane has become more general, whilst extended planting continues, as cuttings become available.

Mr. Brooks visited a considerable number of estates, and is making a collection of vegetable parasites with a view to their correct determination. The local grasses are being studied with the same object. This work is being executed with the help of Professor Trelease.

The lime factory closed on February 27, and during the month also, the office of Assistant Superintendent was abolished.

Plants distributed were: limes, 2,000, nutmegs 4, decorative 6. There were also sent out 136 packets of vegetable seeds.

DOMINICA. Mr. Joseph Jones (Agricultural Superintendent) writes to inform this Office that work in the Experiment Station has included cutlassing, picking and mulching on the lime plots; picking and recording in the case of cacao. In the Gardens, the Castilloa rubber trees have been tapped and attention given to the maintenance of the good condition of the ornamental trees and hedges.

As regards the position of the lime juice market, it is stated that the local price of green limes unpacked was 22*s.* per barrel, and for yellow limes 7*s.* 6*d.* per barrel. Good quality raw juice is in demand locally at 1*s.* per gallon.

Several estates were visited by the Curator during the month, and a considerable number of visits on the part of planters were recorded at the Botanic Station.

Plant distribution included, limes, 200; vanilla, 151; cacao, 50; budded limes, 14; miscellaneous, 26: total, 441. The rainfall for the month was 1·04 inches.

MONTSERRAT. According to the report of the Curator (Mr W. Robson), the law enforcing the destruction of old cotton plants came into operation during the month. This provides that all old plants must be destroyed by February 28. In order to bring the matter before the peasant proprietors, posters have been put up in prominent places stating the main points contained in the Ordinance.

It is expected that the area planted under cotton next season will probably be between 1,500 and 2,000 acres. In connexion with cotton, Mr. Robson reports further, that a statement has been received in regard to the samples of cotton sent for spinning tests to the British Cotton Growing Association. It is satisfactory to know that Heaton 9 is considered one of the two best, although good strains of both St. Vincent and St. Kitts cottons were included.

Considerable work continues to be done in regard to the Bay oil industry, which is rapidly assuming a position of importance. It is reported that 30,000 bay plants have been ordered for delivery this year, and every effort will be made to meet the demand, though it is doubtful whether the orders can be coped with as quickly as might be desired. Nearly 20,000 bay plants were sent out in the past season.

ANTIGUA. It is stated by the Curator (Mr. J. Jackson) that work in the Experiment Station has included the manuring of maize plots at Fitches Creek, and the reaping of sugar-cane manurial plots at Cassada Garden. The cane variety plots have received attention at various centres. Plants distributed included: Eucalyptus, 1,863; onions, 4,600; coco-nuts, 351; forest trees, 225; cane cuttings, 11,028; sweet potato cuttings, 11,500.

The growing cane crop has made a good start, and the stands that have been obtained so far are said to be good.

The Onion Growers' Association has been active. Handling of onions began during the month, and 85 crates were shipped. A meeting of the Executive Committee of the Association was held during the month. The Government granary was expected to open during March. Good rains were experienced during the month, 5·04 inches being recorded at the Botanic Station.

ST. KITTS. The Agricultural Superintendent (Mr. F. R. Shepherd) writes to say that the work in the Experiment Station has consisted in the planting of Indian corn, the reaping of manurial experiments (result poor owing to close planting and attack of worms), and the planting of nine varieties of sugar-cane received from Mauritius. Artificial manures were applied to experimental canes at Brighton and Buckleys estates. There were distributed from the station, 1,500 sweet potato cuttings.

The old cane crop was being rapidly taken off in the Central Factory district, and about 2,000 tons of sugar had been made. During the month, for the first time canes were harvested for the factory from the estates on the new extension on the railway line. Owing to the continued dry weather, the canes were ripening quickly, and reaping operations on the muscovado estates were in full swing. Three of the estates in the Sandy Point district were sending their canes to the factory by boat, the present price of 16*s.* 1*d.* per ton making this possible. The young cane crop was healthy and growing well, but rain, especially in the Basseterre district, was badly needed.

Mr. Shepherd states that although some estates were preparing for the coming cotton crop, there will, however, be a great reduction in favour of sugar-cane.

Appended to Mr. Shepherd's report is a statement by the Assistant Chemist (Mr. H. Waterland), as to the work conducted at the Government Laboratory. This included determination of fibre in sisal hemp, analyses of manures, soap, and soil.

GLEANINGS.

Attention is called in the *Daily Argosy* (Demerara) for February 20, 1915, to the outbreak of anthrax among cattle on the East Coast of Demerara. The necessary provisions have been made to prevent further spread.

The Barbados *Advocate* for February 17, 1915, reproduces an article which says that the Wadsworth 8-h.p. light kerosene tractor, which can be used for many purposes, has worked well in Trinidad. The machine costs, delivered in the West Indies, $1,200.

In this issue will be found two notes on the potash situation. Apparently the discussion of this subject is of much general interest. The *Planters' Chronicle* of Southern India reproduces in its issue for December 12, 1914, a previous article from the *Agricultural News* on the subject

According to a communication from the International Institute of Agriculture, Rome, there are in Martinique seven agricultural syndicates which grant loans to small farmers. In Guadeloupe there are numerous agricultural syndicates, but a scarcity of capital has prevented the development of agricultural credit.

According to *The Times* (Annual Financial Review) for January 22,1915, Great Britain looks forward at the end of this year to a complete dependence as regards sugar, on sugar-cane. It is urged that the powers of the Royal Commission should be extended so that it might investigate fully all sugar resources both within the Empire and elsewhere.

A portion of the editorial which appeared in the *Agricultural News* of January 16 on West Indian exhibits at the Imperial Institute, is reproduced in the *Daily Argosy* (Demerara) for February 20, 1915. It is satisfactory to observe that the local press considers the advertisement of colonies in the way under consideration a matter of economic importance.

According to *The Board of Trade Journal* for January 7, 1915, under memorandum dated December 5, 1914, it is stated that in order to avoid exposure of bananas entering Canada in carload lots, the entry of cars of bananas from the United States will be allowed without examination, if accompanied by a statement to the effect that no hay or straw is used in the packing.

The Leeward Islands *Government Gazette* for February 11, 1915, shows the amount of produce exported from Antigua during January 1 to August 31, 1914, as compared with that for the previous year. It is interesting to record that the greatest increases are shown in the case of sugar and onions. In most of the other products there was a decrease in quantity exported.

In spite of the heavy rains in Demerara, great expectations are held in regard to cane cultivation. The wet weather seems to have interfered with provision crops most, according to the *Daily Argosy*, and on the East Coast many of the villages have been more or less inundated. It is stated that farmers have experienced considerable loss, and there may be a scarcity of food crops in a few weeks' time.

A copy has been received of the Annual Report of the Bureau of Sugar Experiment Stations, Queensland. This includes two sections which may be of interest to those working in connexion with estates in the West Indies (a) work of the southern sugar experiment station, and (b) the results of the sugar experiment plots in different parts of the State. There is also a section on mill work and economics.

The last number of the *Geographical Journal* (for February 1915) is a particularly interesting one. It contains an illustrated account of President Rooseveldt's journey in Central Brazil already noted in this journal from *Nature*. It would seem that President Rooseveldt claims to have been the first explorer of the new river rather than the first discoverer, because the head and mouth were known before the expedition was made.

It would appear that the most critical position in Germany at present is not the feeding of the human population, but rather the provision of food for domestic animals. Large quantities of artificial foodstuffs are taken by Germany in times of peace; for example, she imports no less than over £1,000,000 sterling worth of oil seed from Nigeria. To make up this deficit sugar is being fed to cattle mixed with beet pulp, dried potatoes, fish or meat meal.

In *Co-operation* (the Journal of the Agricultural Organization Society of England) for February 1915, there is a short article by the well-known West Indian land owner, Colonel the Hon. R. Stapleton Cotton, which describes the work of the Egg Collecting Depôt Limited. This has rapidly increased during the last few years, and in 1914 it handled no less than 1,179,903 eggs. After the outbreak of war the depôt supplied large quantities of eggs for wounded soldiers.

Another of Messrs. Cooper and Nephew's profusely illustrated publications has been received, entitled The Royal Show of England and Its Influence on Stock Breeding. It contains excellent photographs of all the prize animals at the Royal Show, 1911 and the text explains the advantages of the various breeds for different purposes. It is noted that the compilers refer to the Tamworth pig as the bacon curer's ideal more than any other. This animal is found in the West Indies.

At a meeting of the Board of Agriculture, Trinidad, held on Wednesday, February 17, 1915, some interesting remarks were made in connexion with the developing cassava industry of that island. In thanking Sir Norman Lamont for his instructive demonstration, it was observed that an account of the meeting (referred to in the last issue but one of the *Agricultural News*) had been read with interest in St. Vincent, and had tended to stimulate the planting of cassava in that island. It was also stated that the Trinidad factory had made an offer of £4 per ton for sun-dried cassava in that island, delivered at the nearest railway station of the producer.

STUDENTS' CORNER.

REPRODUCTION IN FIBRE PLANTS.

There are two important genera of plants represented in the West Indies which produce fibre—Agave and Furcraea. Both these belong to the natural order Amaryllidaceae. The former contains fifty species, all indigenous to tropical America, the latter fifteen. In view of the possibility that the production of fibre from *Agave rigida*, which yields sisal hemp, may become a minor industry in these colonies, there is some reason for directing the student's attention to the general botanical nature of the genera. The poling of Agave is a characteristic sight in the drier districts of all islands in the West Indies, and the student would do well to make observations in connexion with this important matter. From a purely botanical standpoint the inflorescence of these plants is interesting, since it exhibits both sexual and asexual reproduction. As a general rule after the berries have matured, the pole falls to the ground and the entire plant dies, the strain of producing the enormous panicle having resulted in complete exhaustion. The seeds may or may not find an opportunity of germinating. Asexual reproduction consists in the production of bulbils in the axils of the bracts on the pole. If the student removes one of these structures, he will observe that there are formed at the base one or more rootlets. In the ordinary course of events these bulbils fall to the ground around the mother plant, where the rootlets rapidly grow at the expense of the stored-up moisture and food material, and then strike into the ground. A characteristic feature of Furcraea is the formation of bulbils in place of some of the flowers. This gives the peculiar appearance which has led to the erroneous idea in some cases, that the seed is capable of germinating *in situ*, in other words, that Agave and Furcraea are viviparous.

From an economic point of view, poling is of importance because it is the limiting factor in the life of the foliage. It is desirable that poling should be delayed as long as possible in the cultivation of Agave in order that the maximum number of leaves may be obtained without replanting. Observations have been made in Jamaica which tend to show that the poling of *Agave sisalana* is retarded by the presence of lime in the soil. Whether this observation is of quite general application has not yet been fully established, and it would serve a useful purpose if the student made notes on the poling habits of Agave growing under different soil conditions. It is conceivable that useful information may be got from past observations of people who have resided in different districts for long periods. At any rate it would be of value to endeavour to collect as much information as possible on a point of both scientific and economic interest.

Questions for Candidates.

PRELIMINARY.

1. Contrast the functions of the leaf and the root of a plant.
2. Name and describe three plants useful for hedge growing. Indicate their useful characteristics.

INTERMEDIATE.

1. Give an account of the work conducted on the experimental plots during the past year at the Botanic Station of the Colony where you reside.
2. What are the different ways of conserving soil moisture?

FINAL.

1. Enumerate as many different kinds of bean as you can. State which you consider most useful for local cultivation as a field crop.
2. Discuss Indian corn as a foodstuff.

RECENT WORK ON THE PHYSICAL ANALYSIS OF SOILS.

An abstract appears in the *Experiment Station Record*, Vol. XXXI, No. 7, on the separation of soil particles according to their specific weight, and on the relations between plants and soil. The information is important. Experiments are reported to have been made on the mechanical separation in the above manner of seven soils for the determination of humus, colloids, etc., and it is stated that several years' cropping experiments were conducted with six soils, to determine the manner in which individual crops are nourished from the same soil.

'In the first experiments, bromoform having a specific weight of 2·83 was diluted with benzol until at a specific weight of 2·64, the heaviest part of the soils sank in the mixture. By further decreasing the specific weight of the liquid mixture to 2·55, 2·49, and 2·36, the soils were separated into five fractions according to specific weight, the lightest of which was suspended on the liquid having a specific weight of 2·36.

'The ease or difficulty with which a soil was separated into its constituents was found to indicate the uniformity of its composition. An abundant separation of the specifically lighter constituents indicated a soil rich in colloids, humus, and available plant food, while the separation of an abundance of specifically heavier constituents indicates a less productive soil, poor in humus and available plant food, although not necessarily with a small absolute pure food content.

'Clay soil contained none of the constituents of specific weight higher than 2·64, and the sand, loamy sand, loam, and limy soil contained only 1 per cent., while the soils contained up to 7·3. The greatest percentages of organic matter, colloids, and available plant food were usually found in the fifth and lightest fraction, and there was usually a steady increase from fraction 1 to fraction 5 in this respect. The most silica, iron oxide, and clay were found in the fraction containing the most plant food. It is concluded that the analysis of a soil with fluids of different specific weights indicates the relative quantities of its constituents and the distribution of plant food in them.

'In pot experiments in the plant house, crops yielded more dry matter per unit of area of soil than those grown in the open. The assimilation of plant food, especially phosphoric acid, was much greater in warm dry summers than in cool summers, but the increase in dry matter was not correspondingly great. Definite relations existed between the quantity of plant food and the quantity of dry matter obtained, the most marked of which was with nitrogen. It is concluded that if 100 grammes of plant dry matter contained less than 1·61 grammes of nitrogen, 0·59 gram of phosphoric acid, or 1·66 grammes of potash, the soil needs fertilization with the deficient foods, while if the 100 grammes of dry matter contains more than 2 grams of nitrogen, 1 gram of phosphoric acid, or 2·14 grammes of potash, no fertilization with these plant foods is necessary.'

FUNGUS NOTES.

THE EFFICIENCY OF FUNGOID PARASITES OF SCALE INSECTS.

The control exercised by parasitic fungi on scale insects infesting economic plants has been the subject of considerable attention in the Lesser Antilles, as elsewhere in tropical and subtropical regions, during the past few years.

Our knowledge is yet far from exhaustive, either as to the fungi concerned or their relative distribution and efficiency, but certain general principles have by now emerged.

While these are not different from what might have been intelligently anticipated, they are valuable as being the results of experience and observation. As such, they may be worth stating in view of the impossible hopes which still linger here and there with regard to the artificial distribution of these fungi.

Speaking first of all quite broadly, it may be said that the efficiency of the fungi is proportional to the humidity of the air amongst the plants on which their hosts occur. Their relative abundance in the islands of the Windward and Leeward groups follows pretty closely the amount of rainfall usual to each island, though the distribution of rain is so local that the wetter islands each have areas in which the fungi are of little use, and the driest island has sheltered moist situations in which they are effective. Still speaking broadly, it may be said that in Dominica, in normal years, the control is as efficient as natural agencies can well produce. Conditions are generally such that the red-headed fungus (*Sphaerostilbe coccophila*), the white-headed fungus (*Ophionectria coccicola*), the black fungus (*Myriangium Duraei*) certain Aschersonias, and the shield-scale fungus (*Cephalosporium lecanii*), keep in check established colonies of scale, and follow so closely on new infestations that the effects of the insects are negligible. In most parts of St. Lucia, and in the wetter districts of Grenada and probably of St. Vincent and Montserrat, the control approaches to that in Dominica. In the drier districts of these islands the fungi, while present, are not so effective, or are more restricted to a seasonal activity. With reasonable accuracy it might be said that excepting the shield-scale fungus and one on sugar-cane mealy-bugs, the limits of successful cacao and lime cultivations are the limits of the effectiveness of scale-destroying fungi. It is not suggested that there is in this a relation of cause and effect, but rather that in the islands under consideration, the necessary conditions as to climate are about the same in both respects. A case might indeed be argued with regard to Montserrat, that the depressed condition of lime cultivation in some parts of that island is due quite as much to the checking of beneficial fungi by recent dry years as to the direct action of such conditions on the plants themselves.

This leads to the consideration of the fact that the matter is not quite so simple as has been assumed for the purposes of general statement above. The rapidity of effective reproduction by the insects has to be taken into account as well as the powers of attack of the fungus parasite, and in this the condition of the plant is usually, perhaps always, the determining factor.*

Even in the favoured districts of Dominica and St. Lucia plants transferred from the nursery to the field may become badly infested until they get established, and require, or would be the better for spraying. In connexion with older trees, the influence of other factors stands out where fungus control is less complete, as in cases recently observed in Grenada, where particular mango trees were heavily infested, though the shield-scale fungus was present in some abundance, while others near by were quite clean.

Resuming the consideration of the effects of humidity on the fungi in question, their distribution in Barbados is instructive. The rainfall is low, and the island in general is open and windswept. With the two exceptions noted, the fungi enumerated above are absent save in a very few sheltered spots. In deep gullies and in small orchards among the hills where the rainfall is greatest, the writer has seen the red headed fungus and one of the Aschersonias, the former with a restricted range of hosts, and appearing to exist very precariously. A similar, though perhaps less extreme, situation seems to prevail in Antigua, St. Kitts, and Nevis—islands of relatively low rainfall.

Coming to the fungi mentioned above as exceptions whose distribution is not so strictly limited, one of them *Aspergillus parasiticus* the sugar-cane mealy-bug fungus, is readily accounted for. It is not less dependent on moisture but finds it accompanying its hosts in the enclosure formed by the base of the leaf-sheath around the buds of the cane, a situation in which water collects and lingers. The shield-scale fungus is more remarkable. Even in Barbados it persists through the driest season with little shelter, and becomes very active with somewhat small encouragement in the wetter months.

The only relevant difference known to the writer between its spores and those of the other scale fungi is that they are enclosed in a drop of mucilage. Whether this or some constitutional factor accounts for its hardiness would be difficult to determine.

This discussion will be continued in the next issue of the *Agricultural News*.

W.N.

*This is a subject which though often and long ago remarked upon, does not appear to have received the attention from entomologists that it deserves, probably because to get beyond simple observation—nowadays discredited if it cannot be expressed in the form of a table—requires the co-operation of the bio-chemist. In one such case it has been suggested (A. F. Woods, *Bull. 19 of Veg. Phys. and Path.*, U.S.D.A.) that a high oxydase content of the sap is especially favourable to the increase of closely allied insects (Aphides).

His Honour the Administrator of St. Vincent has furnished this Office with a copy of the report of the Directors of the St. Vincent Agricultural Credit and Loan Bank, Limited. This is not an agricultural credit society under the Act, nor is it run on Raiffeisen lines. But the bank continues to do excellent work, and is in a very thriving condition. The net profit for the past twelve months was $1,049·49. In spite of last year being one of industrial depression, the bank has not failed to make financial progress.

An inexpensive and thoroughly efficient type of drain has been evolved to meet conditions in the Federated Malay States in connexion with the prevention of malaria. *Nature*, for February 11, 1915, says that this is formed of concrete blocks of half-egg shape laid close but unjointed. The blocks are laid without foundation even on bad ground in flowing water. Should they move out of line or gradient, it is easy to reset them correctly when the surrounding ground has settled, after which they give no trouble; but resetting is rarely necessary.

RADIUM AND PLANT GROWTH.

Summary of Results in connexion with Cultivated Crops.

The effect of radio-active substances on plants has been dealt with from time to time in past issues ef this journal. Reference to page 21 in Volume XIII (1914) will show the statements made by Mr. T. Thorne Baker before the Royal Society of Arts, in connexion with the utilization of residual radio-active waste material. After intimating the fact that the stimulating effect of radium had been demonstrated, Mr. Baker pointed out that the comparatively large supplies of cheap material should render possible the utilization of radio-active material in practical agriculture. In this article reference was made to extraordinarily high returns obtained with radishes, though against this was the result obtained by the English Board of Agriculture in its experiments with wheat, which gave a much lower increase in yield due to radio-activity. On page 215, in the same volume, another article refers to Truffaut's experiments in France. These had regard principally to the relationship between radio-activity and the supply of soil nitrogen. This investigator found that the effect of the radium was greatest where the percentage of nitrogen present in the soil was least. It was also stated in this article that Truffaut had obtained satisfactory results with black oxide of uranium. This was rightly held to be a result of importance, since this compound is far cheaper than the ordinary radio-active ores. The reader will learn with interest later in this article the results of English experiments with this oxide.

The last note on the subject to appear in this journal was that on page 310, which had regard to the Reading Experiments conducted last year by Martin Sutton. Mr. Sutton has just furnished this Office with his Bulletin No. 6, which contains a full report of the trials made in 1914. It may be interesting to mention here the various radio-active materials which were used. There was first radio-active ore certified to contain approximately 8 milligrammes of radium bromide per ton of ore; secondly, similar material containing 9 milligrammes of radium bromide per ton; thirdly, mine residue after radium had been extracted, but certified to contain 1·8 milligrammes of radium bromide per ton; lastly, black oxide of uranium.

The general results obtained were to the effect that radium has a distinct stimulating action on plant life in general, and that the emanations possess the property of developing and increasing growth. Many of the radish, lettuce, and pea trials which were dressed with ore showed considerable superiority over those grown in plain soil, but the cost of the ore far outweighed the worth of the increase. On the other hand, it is held that if future investigation shows conclusively that soil once dressed with radio-active material can be used over a period of years, the original outlay may be justified. The results obtained with black oxide of uranium were by no means as satisfactory as those got by Truffaut noted above, though it is true that the experiments were more limited in number. In every case where it was used, the action of the oxide appeared to retard flowering, and to affect foliage and growth much in the same manner as a nitrogenous manure. Mr. Sutton does not give any figures to show the results of his experiments with uranium oxide, though the illustrations are perhaps sufficiently striking. What seems to us one of the most interesting results of Suttons' work is the demonstration that radio-active ores do not take the place of manures. It is noticeable in most of the experiments that the effect of the radium was increased by applying fertilizers along with it. This, however, in the case of nitrogen at least, is not in harmony with Truffaut's work. Suttons' experiments with germination in relation to radio-active ores and residues did not give conclusive results. It is proposed to continue these and the other experiments on modified lines, based on the experience already gained.

A very clear account of the history of redio-activity in relation to plant growth, particularly in regard to America, is contained in the *Journal of the New York Botanical Garden*, for January 1915. This lengthy article, by H. H. Rusby, Dean of the College of Pharmacy, Columbia University, outlines the work of Gager, Stocklasa (at Prague), most of the French work, and the writer's own experiments in New Jersey. It is not intended to give, in detail, the results obtained by these investigators, but it must be mentioned that Stocklasa of all investigators conducted perhaps the largest number of experiments, and certainly obtained the most sensational results. Some of these will be considered for comparative purposes in due course. It should be noted here, however, that Stocklasa believes that radio-activity can build up sugar in the plant in the absence of sunlight, and in other ways favourably influence the living processes of cells.

Rusby's work was conducted with a large number of vegetables, both temperate and tropical, on fair sized plots with varying quantities of what he calls his radio-active fertilizer (R.A.F., composition not given). In making these trials, theoretical considerations were ignored, and the trials were conducted precisely in the manner in which a farmer would proceed in preparing the land and applying the radio-active material for a market crop. The largest gains recorded were in the Nutley experiments, which amounted to 129 per cent., and at Northfield, 135 per cent. Families of plants were found to show the same varying susceptibility. Members of the Cruciferae, to which the cabbage belongs, were greatly benefited. So were the Cucurbitaceae, comprising the pumpkin, cucumber, and squash. The Gramineae or grass family, comprising hay, corn, sugar-cane, sorghum, and lawn grass, was enormously benefited. This does not mean that experiments were tried with sugar-cane (though they were with corn), but that it is simply believed that radio-active material will stimulate the growth of sugar-cane. Although Rusby's maximum results were obtained with turnips, it will be convenient in concluding this article to consider his figures obtained in the case of peas, because this crop in relation to radium was also investigated by several of the other experimenters already mentioned. The following table shows the maximum increases recorded by different workers in connexion with the effect of radio-activity on peas grown in unmanured soil:—

Stocklasa (Hungary)	200 per cent.
Sutton (England)	75 „ „
Rusby I (United States)	22·5 „ „
Rusby II (United States)	51·7 „ „

Consideration of these figures will make it evident that in spite of a large variation, there is considerable ground for believing that radio-active material can greatly increase the yield of cultivated plants in certain cases. From an economic standpoint, it would appear that at present the essential thing is to obtain a source of radio-active material which is cheap, and to prove that after application its effect will be lasting and never harmful. It would seem possible that as the radium industry develops, it may be found practicable to utilize some of the cheap by-products, like carnatite, in agriculture. Till this has been done we can hardly do more than regard the effects of radio-active substances on plant growth as a matter of great scientific interest with considerable commercial possibilities.

MARKET REPORTS.

London.—The West India Committee Circular, February 23, 1915.

Arrowroot—2*d.* to 4½*d.*
Balata—Sheet, 2/3½; block, 1/11 per lb.
Beeswax—No quotations.
Cacao—Trinidad, 80/- to 83/- per cwt.; Grenada, 75/ to 78/6-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £27 to £27 10*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 12*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/4 to 2/9; concentrated, £21; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations
Mace—8*d.* to 2/11*d.*
Nutmegs—4¼*d.* to 5¾*d.*
Pimento—Quiet.
Rubber—Para, fine hard, 2/6; fine soft, 2/3; Castilloa, 1/11.
Rum—Jamaica, 2/3 to 2/6

New York.—Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11⅞c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9¾c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$3·75 to $4·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11¾c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89°, 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 22, 1915.

Cacao—Venezuelan, $16·75 to $17·00; Trinidad, $16·25 to $16·75.
Coco-nut Oil—93c. per Imperial gallon.
Coffee—Venezuelan, 11c. per lb.
Copra—$4·50 to $4·75 per 100 lb.
Dhal—No quotations.
Onions—$3·75 to $4·10 per 100 lb.
Peas, Split—$9·75 per bag.
Potatoes—English $1·30 to $1·40 per 100 lb.
Rice—Yellow, $6·25 to $6·30; White, $6·75 per bag.
Sugar—American crushed, no quotations.

Barbados—Messrs. T. S. Garnett & Co., March 5, 1915.

Arrowroot—$4·00 to $4·50 per 100 lb.
Cacao—$13·00 per 100 lb.
Coco-nuts—$16·80.
Hay—$1·75 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $82·00 per ton.
Molasses—No quotations.
Onions—$5·75 to $6·00 per 190 lb.
Peas, Split—$12·75 to $13·31; Canada, no quotations.
Potatoes—Nova Scotia, $3·25 per 160 lb.
Rice—Ballam, $6·10 to $6·25 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, no quotations.

British Guiana.—Messrs. Wieting & Richter, February 6, 1915; Messrs. Sandbach, Parker & Co., March 19, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	14c. per lb.	14c. per lb.
Cassava—	$1·08	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	——	16c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	16c. per lb.
Liberian	10c. per lb.	10c. per lb.
Dhal—	——	$6·75 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	——
Peas—Split	——	$13·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 40c.	——
Potatoes—Nova Scotia	$2·25 to $2·40	$2·25
Lisbon	——	——
Potatoes—Sweet, B'bados	$2·16	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
Tannias—	$2·16	——
Yams—White	——	——
Buck	$2·04	——
Sugar—Dark crystals	$3·40	$3·50
Yellow	$4·00 to $4·10	$4·00
White	$5·10 to $5·25	——
Molasses	$2·90	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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Origin of West Indian Economic Plants and Animals.

II.

IT was shown in the last editorial that most of the important economic forms of life in these islands are of exotic origin, that is, they have all been introduced more or less by human agencies. It is our object now to consider these agencies, not only of the past, but also of the present. For the essential fact to bear in mind is that introductions are still continuing, none perhaps being so revolutionary in their effects as the ones enumerated in the first part of this article, but all just as important as regards their cumulative influence upon local agriculture, the present policy of which is diversification.

The early introductions of great note, like the coming of the sugar-cane, the cacao tree, and some of the domesticated animals were characterized by their being essentially the outcome of individual efforts. There was no organization underlying the introductions. In many cases they were the accompaniments of pioneer immigrants, who brought them to the islands because they had proved economically valuable elsewhere. An interesting case of this is the origin of pigs in Barbados, which were brought over by the Portuguese when they first discovered the island some three hundred years ago. Oldmixon records in 1708 that Barbados was almost overrun with wild pigs. That these animals found in the West Indies a congenial and natural environment is a fact worth remembering in connexion with the proposed extension of pig raising at the present time, which in itself will necessitate further introductions of special breeds.

In many instances early introductions by enterprizing individuals turned out to be of far greater economic importance than was ever imagined at the time. In fact, in one case the discovery of the economic value of a plant was quite accidental. About the year 1744, the then Chief Justice of Jamaica introduced some seed of Guinea grass (*Panicum maximum*) as food for some extraneous birds. The birds died and the seeds were thrown away. They germinated, and the avidity with which the cattle consumed the resulting grass suggested the idea of cultivating it. Guinea grass is now found everywhere as the principal fodder for West Indian live stock.

In the beginning of West Indian colonization the only travellers to visit the islands were explorers and naval men. A considerable debt is owed to the British Navy in respect of importations. It is recorded that Lord Rodney was the original introducer of the much-soughted No. II variety of Mango, and Captain Bligh the introducer of the Breadfruit, was also a naval man. In fact it is evident generally that navigation as a qualification in the case of early introducers of plants was a *sine quâ non*.

The advent of institutions in the matter of the introduction of economic forms was gradual. As regards plants, the Royal Gardens, Kew, have figured always as the central establishment in this respect, and deserve special consideration. According to Thiselton Dyer's most interesting historical account,* the Gardens first came into existence about the middle of the sixteenth century—over 350 years ago. The Gardens were then simply Royal domains, and had no official status as they have at the present time. It was not until the time of Francis Masson (1772) that Kew's Imperial work began. Masson was one of the pioneer collectors sent from Kew, and following him, in fairly quick succession were others. Most of these early botanists were attached to exploring or surveying ships, and although their work was principally confined to collection for Kew itself, this work resulted in a distribution of plants from Kew in later years to different parts of the world. Even before 1841, in which year Kew became a Government institution, considerable botanical assistance was given to the Colonies. In answer to Dr. Lindley's report on the Gardens (1838), in which it was stated, 'that no communication with Colonial Gardens is apparent from the Garden book of Delivery,' John Smith (at that time Foreman) showed that this statement was based on a misapprehension, and referred to the fact that in 1818, Mauritius was supplied with European fruits from Kew; New South Wales was also early supplied with useful fruits, 'and there was a considerable intercourse with India and China through the East India Company's ships, in some cases, on an extensive scale, as for instance, in the Spring of 1806, fourteen boxes of plants were sent by the ship "Thames" to India.' No reference is made to the West Indies, but it is unlikely that Kew failed to participate even at this early date in the botanical establishment of these Colonies.

In 1841, Kew became a Government institution under the old Woods and Works Department, and the famous botanist, Sir William Hooker was appointed as the first Director. From that time up to the present Kew has played an integral part in the agricultural development of these Colonies.

Any attempt to enumerate the plant introductions to the West Indies for which Kew has been responsible would be impossible in the space of this short article. It will answer, however, our present purpose, to refer to general statements made from time to time by the Colonial Office. In a speech delivered in 1895, the Marquis of Ripon, K.G., Secretary of State for the Colonies, said: 'Great work has been done and is being done [by Kew] . . . . to aid the Colonies in the introductions of new plants.' Special reference was made to the West Indies in this respect. 'Almost all our natural products have been, through the agency of Kew, introduced into Jamaica.' Again in 1898, Mr. Chamberlain said: 'Let me express . . . my deep sense of obligation to the authorities at Kew for the assistance they have given me in regard to the West Indies and other colonies.'

On the formation of the Imperial Department of Agriculture for the West Indies in 1898, Kew was relieved of a considerable amount of its West Indian work—in fact one of the reasons for the new Department was to effect this relief. The relationship, however, between the Imperial Department and the Royal Gardens has from then up to the present never ceased to be most intimate, for not only is Kew the most authoritative botanical institution, but it also has personal ties with the Imperial Department as well as scientific, since its former Assistant Director was selected as the first Imperial Commissioner of Agriculture for the West Indies.

A noteworthy feature of the last twenty years has been the formation of other agricultural departments in the Colonies, and these have conferred considerable benefit on the West Indies in the matter of plant exchanges. The Tropics at the present time possess well-defined lines of botanical communication, but all these lines meet at Kew, which may be regarded as the central exchange. The amount of local literature on economic botany has also vastly increased, and, as a whole, communication is so good that hardly has a new economic plant proved a success in one colony before others similarly situated are making enquiries concerning its introduction to them. This line of work constitutes one of the important functions of the Imperial Department of Agriculture for the West Indies.

It may appear to the reader that the theme of this article is an appreciation of Kew. We should

* *Kew Bulletin*, No. 60, 1891. See also *The Royal Botanic Gardens, Kew: Historical and Descriptive.* By W. J. Bean, Assistant Curator.

hasten to acknowledge other agencies as well. First and foremost, there are the pioneers who have settled in these islands, and who have by individual enterprise and keenness been responsible for many important introductions. This observation refers especially to former Kew correspondents, some of whom were planters who devoted their leisure time to the study of local botany. Others, again, interested in practical agriculture have obtained new varieties and species on a purely business footing. Such enterprise is equally beneficial in the long run. Of recent years the West Indies have owed a great deal to the United States, particularly to the Southern States where climatic conditions and hence vegetation are more comparable to our own. It may not be irrelevant to point out that in considering West Indian commercial relationships with the Mother Country and the United States, it is only fair to remember the debt we owe in regard to our economic flora on which our prosperity depends. The intrinsic value of an imported seed or cutting of a useful plant is inconsiderable: but its potential value may be enormous.

Very little has been said in the course of this article in respect of the agencies through which animals have been introduced. As a matter of fact there is, comparatively speaking, very little to say, because domestic animals do not underly the staple industries of the West Indies to anything like the extent plants do. Several instances of the different agencies have been noted however in a former article, and it will be realized that these have been generally speaking, individual, and during recent years the outcome of local initiative on the part of planters, and latterly of the Departments of Agriculture. The agencies through which pests and diseases arrive can scarcely be dealt with in this article, as it is a subject which requires special treatment. It may be observed, however, that it is the function of Kew and the Departments of Agriculture in the Colonies and in foreign countries to prevent the distribution of these parasites, just as it is their object to encourage the distribution of the species or varieties which these parasites attack.

INDIAN CORN.

MEASUREMENT OF INCREASED YIELD FROM HYBRIDIZATION.

So large a proportion of first-generation maize hybrids have been found to give increased yields, and the increase is frequently of such magnitude that the utilization of this factor of productiveness becomes a practical question. It is therefore highly desirable to understand the reasons why some crosses give favourable results and others give little or no increase over the yield of the parents. A necessary step in this direction is to develop a reliable method of measuring the effect of crossing, apart from other factors that influence yield.

The development of satisfactory methods of comparing the yield of first-generation hybrids with that of their parents has been retarded by (1) a failure to fully appreciate the importance of individual diversity in hybrids, (2) the abnormal behaviour of self-pollinated maize plants, and (3) the difficulty of securing for comparison hybrids and parents with identical ancestry. It is believed that the method here described avoids these difficulties and affords more accurate means of comparing first-generation maize hybrids with their parents.

The method is illustrated by an experiment in crossing two varieties of sweet corn in which it was found that the progeny from one hybrid ear yielded nearly double that of the other hybrid ear involved in the experiment. To have taken either ear alone would have led to entirely erroneous conclusions regarding the increase secured as a result of crossing.

The increase in yield due to crossing as measured by the method here proposed was 31 per cent.

The most important conclusion arrived at by G. N. Collins, to whose paper in the *Journal of Agricultural Research* (October 1914) the above is the summary, appears to be that the mean yield produced by seed from two hybrid ears compared with the mean yield produced by seed from the two pure seed ears gives a fair measure of the effects of hybridization.

New Method of Growing Corn.—The *Experiment Station Record*, Vol. XXXI, No. 7, states that corn has been planted successfully under dry land conditions in western Kansas, by the following methods. The seed is sown in rows twice the usual distance apart, while the plants are twice as thick in the row. The stand is therefore the same, but as this method seems to preserve the moisture midway between the rows, the supply is often sufficient to maintain the corn in a flourishing condition during temporary periods of drought, while occasionally it may complete the development of the crop. It is noted that by this method the yields were about 30 bushels per acre, while in adjoining fields in which the rows were $3\frac{1}{2}$ feet apart, the yields were only 10 to 12 bushels per acre.

It is stated in the *Journal of the Royal Horticultural Society* for November 1914, that a new bean known as Tepary, a supposed variety of *Phaseolus acutifolius*, Gray, has been found in the arid districts of Arizona to yield four times as much as kidney beans. It is well adapted to dry farming on account of rapid germination with but little soil moisture. If once established, it will stand protracted seasons of water famine. Another note in the same journal makes an interesting reference to the occurrence of gloss and colour in beans—a subject investigated in the United States. No generalizations are attempted, but a long series of crosses has been made, and the results obtained tabulated. The flower colours recognized are white, light pink, pink and crimson, and what is especially interesting, it is considered that blossom colour is closely correlated with seed coat colour.

SUGAR INDUSTRY.

THE RATIONAL MACERATION OF MEGASS.

An interesting article by the late Leon Pallet on the Rational Inbibition (Maceration) of Bagasse in the cane-sugar factory appears in the February issue of the *International Sugar Journal*.

The writer first lays stress on the necessity for exercising control over the quantity of water employed and its manner of application: he recommends that where higher maceration than 10 per cent. is practised, it is well to have the work under the supervision of a special operator, and that the water-supply for the various distributors should be capable of control from one central point from which the operator can see the work going on at each of the several mills.

He recommends the use of hot water, i.e. having a temperature of at least 80° to 85° C., and as it apparently takes some appreciable time for the water effectively to penetrate the megass, he suggests that it is advantageous that there should be a considerable distance between the mills.

It is pointed out that passing the water through pipes pierced with holes, such as form the usual installation for the purpose, gives a very uneven distribution of the water; in consequence he advises that atomizing injectors should be used. These should be of bronze with removable and perfectly fitting connexions, all the pieces being interchangeable. The useful suggestion is made that when these injectors are screwed into place, they should be secured there with a drop of solder to prevent their being tampered with. This solder is readily removed when it is desired to disconnect an injector.

Stress is laid on the necessity for the water being perfectly free from suspended particles so that no interruption of the injectors may take place, and in order that there should be no irregularity in the delivery of the water.

It is desirable that the water should be applied in a very fine spray, and it is suggested that this may be secured by working with a pressure of about 3·3 lb. per square inch, but that it is not necessary to exceed this pressure. The pressure may be obtained by drawing the maceration water from tanks placed at an elevation, and it is pointed out that this elevation should not be less than about 26 feet, and may with advantage be even up to double this, namely 50 to 52 feet. Care should be taken to maintain, as far as possible, a uniform level of water in the tanks so that the pressure may also be uniform.

The use of a pump is recommended as a preferable means of securing uniformity: in this case any undesirable increase or variation in pressure is guarded against by placing a safety valve on a branch pipe returning to the pump suction tank.

It is suggested that low pressure steam may be used for partial maceration purposes, and that this may be applied by means of the atomizing injectors: the recommendation is to use steam in any case only for partial maceration: any attempt to use steam alone will result in inconvenience from the cloud of uncondensed steam that will arise from the mills.

The use of last mill juice for maceration purposes is discussed, and it is pointed out that this presents some difficulties owing to the trouble caused by finely suspended particles of megass, and from the fact that owing to the ready fermentability of this juice, troublesome fermentations may be set up.

CANE-SUGAR MANUFACTURE IN HAWAII.

The following is a summary of a paper read by Nöel Deerr on the status of cane-sugar manufacture in the Hawaiian Islands before the Eighth International Congress of Applied Chemistry, Washington and New York, 1912:—

The general status of manufacture may be seen from the annexed summary, which is based on statistics covering over 90 per cent. of the output of the last five years. The mean figures are true averages and take into account the different amounts produced in the different factories. The figures except when otherwise indicated refer to percentages of the sucrose in the raw material.

	High.	Low.	Mean.
Sucrose per cent. cane	16·6	11·2	14·4
Fibre per cent. cane	15·0	11·0	12·3
Sucrose obtained by mills	96·8	89·0	93·5
Sucrose lost in bagasse	11·0	3·2	6·5
Sucrose lost in scums	1·0	·03	·2
Sucrose lost in molasses	11·0	5·0	6·5
Unknown losses	4·0	·1	1·3
Sucrose in sugars	90·0	70·0	85·5
Sucrose in sugars per 100 sucrose in juice	94·0	82·0	91·5
Purity clarified juice	92·0	82·0	88·0
Purity sugars	99·0	97·2	98·0
Purity waste molasses	57·0	39·0	45·0
Commercial sugars % on cane	14·7	9·1	12·7

THE MOLASSES PROBLEM.

An important paper by Nöel Deerr on the Cuban Sugar Industry is reproduced in the latest issue of the *West Indian Bulletin*, and includes the following observations on the molasses problem in that country. Mr. Deerr argues that the price obtained normally for molasses is not reasonably high enough if one works out the value of molasses on the basis of its industrial potentialities, which include the manufacture of alcohol, potash (both very important just now), and nitrogen. To these might be added the utilization of molasses directly on a large scale in pig raising (see p. 118 of this issue) and its employment in the manufacture of acetone used in the preparation of explosives. Mr. Deerr says:—

Connected intimately with the well-being of the cane sugar industry in Cuba is the molasses problem. At the present moment the molasses production in the 178 factories in Cuba is sold at rates varying from $2\frac{1}{3}$ to 4c. per gallon, and this may, on an average, be estimated to give the sellers a profit of one cent per gallon. I do not think this profit is reasonable, and I particularly wish to place before you the facts as to the molasses annually produced in Cuba.

For the crop of 1913-14, the sugar production of Cuba was very nearly 2,600,000; at a low estimate this must have produced 40 gallons of molasses per ton of sugar, or in all, 100,000,000 gallons of molasses. With the most modern processes of fermenting and distillation, these 100,000,000 gallons of molasses could have produced 40,000,000 gallons of commercial alcohol; in actual practice at the present time, as a source of power, alcohol is worth, bulk for bulk, 60 per

cent. of gasoline; these 40,000,000 gallons of alcohol would thus be equivalent to 24,000,000 gallons of gasoline; worth 36c. per gallon, and in all $8,640,000. This would give to alcohol a value of 23c. per gallon, and enable it to compete with gasoline.

In addition to the sugar in the molasses, a very great proportion of the potash removed from soil by the crop of cane is to be found in the molasses. I have not available any analysis of Cuban molasses showing the percentage of potash, but in all probability this will not be below 3 per cent. The 100,000,000 gallons produced for the crop of 1913-14, in Cuba, will weigh in all 600,000 tons, so that this molasses will contain 18,000 tons of potash. The present price of sulphate of potash in Cuba is $55 per ton, which would give to the potash a value of $110 per ton; the 18,000 tons of potash contained in the molasses have then a value at the current price of $1,980,000.

In addition to the potash, molasses contains a small but very appreciable quantity of nitrogen, which I will, in the absence of detailed analysis of Cuban molasses, take as being ·5 per cent.; then, there is contained in the molasses, 3,000 tons of nitrogen, having a market value of $1,200,000 when valued as commercial fertilizer.

In addition there is a small quantity of phosphoric acid in molasses, which will not be taken into account.

The following tabulated statement gives the gross value of the three principal products of the molasses output, based on a production of 2,500,000 tons of sugar:—

Alcohol, 40,000,000 gallons, worth 20c. a gallon	$8,000,000
Potash, 18,000 tons, worth $110 a ton	1,980,000
Nitrogen, 3,000 tons, worth $400 a ton	1,200,000
	$11,180,000

It is one thing to make a calculation showing the possible value of the products to be obtained from the molasses produced annually in Cuba, but before these can easily be realized, it is necessary to demonstrate the possibility of a market for them. I believe that a very extended use for the alcohol capable of being produced locally can be found within the limits of the sugar plantation in the following cases:—

(*a*) Alcohol-burning locomotives.

(*b*) Alcohol-burning tractors, to be used in propelling ploughs, cultivators, and other agricultural implements.

The 18,000 tons of potash contained in the molasses produced annually in Cuba, are several times more than is the quantity imported annually into Cuba, for use as a fertilizer, which amounts at present to about 3,000 tons. I am informed that great difficulty would arise in the marketing of this product, since the world's supply of potash is controlled by a German syndicate prepared to crush any competition; this monopoly of potash is keenly resented in the United States, where any source of supply would be eagerly welcomed, and where we should have to look for a market.

I would, in addition, point out to you that the recovery of alcohol, potash and nitrogen from the molasses presents no technical difficulties, as many plants on the Continent of Europe already work up beet molasses; the process is simple, and the plant not expensive; I estimate that ten centralized distilleries, located at different points in Cuba, could be erected for a capital cost of, say, $1,800,000, and that these would be capable of treating the whole molasses output of Cuba.

This subject of molasses utilization has been written to death in the technical journals of the last few years, but I do not think any harm will be done if the possible magnitude of the industry is placed before you, even when unaccompanied by any definite statistics. The one outstanding trouble in Cuba is shortage of labour; the increase of the capacity of a limit of labour through the medium of mechanical appliances, will always be of great benefit to a community such as exists in Cuba; a cheap source of power at present almost wholly unutilized, is available; and I believe that it would be greatly to the advantage of Cuba.

THE GOVERNOR PLUM AS A HEDGE-MAKING PLANT.

The information in the following note has been received from Mr. A. J. Brooks (Agricultural Superintendent, St. Lucia) in connexion with the recent editorial, The Importance of Enclosures, which appeared in the *Agricultural News*, March 13, 1915. Mr. Brooks expresses the opinion that the subject of hedge-making is worthy of special attention, and is one that has been badly neglected in these islands. He continues:—

In connexion with this matter I should like to draw attention to the advantages to be gained by the use of the Governor plum (*Foacourtia sepiaria*) as a hedge plant. It is beyond doubt one of the best plants for general use, growing well both in wet and dry situations. It bears long needle-like spines of great strength. These surround the stem from the surface of the soil to the highest tip, thus forming a fence which is impenetrable.

Unlike many other plants used for hedges, the Governor plum does not produce quantities of brightly coloured flowers which often clash with other colours if grown near beds or borders; neither does it become unsightly when the flowering stage has passed; nor does it produce quantities of wind-borne seeds which often become a serious pest in cultivated land.

From the minute white flowers of the Governor plum, round plum-coloured berries are produced which can be made into a very agreeable jam or preserve. The plant is a quick grower, hardy and evergreen. Its pink-coloured young growths render it attractive and ornamental. When cared for and clipped regularly it forms a dense compact hedge 3 to 4 feet thick, and may be grown up to a height of 10 to 12 feet.

A hedge such as I have described was grown at the Agricultural School, Dominica, and its presence added considerably to the general striking appearance of the ground. This plant is being used largely for hedges and wind-belts at the Agricultural and Botanical Station, Choiseul, St. Lucia.

It is stated in the *Experiment Station Record* for December 1914, that minute doses of hydrocyanic acid have been injected into maize and hemp, with the result that it has been utilized by the plants in question. The investigator had previously found that the poison injected into the plants was probably broken up by reaction with substances in the plant juices, one of the products thereof being ammonia. His latest results, therefore, tend to support previous ones. It may be added that Treub put forward the view, based on experiments, that hydrocyanic acid is the first compound produced in the synthesis of protein from nitrates and carbohydrates.

THE PIG-RAISING INDUSTRY.

SUGGESTED BACON FACTORY FOR THE WEST INDIES.

The need for greater agricultural diversification in most of the West Indian islands, and the importance at the present time of local food production, have led to the formulation of a scheme by Dr. Francis Watts, C.M.G., whereby a new industry may be added to those already existing. This new industry consists in the production, on co-operative lines, of pork and bacon.

In the recently issued number of the *West Indian Bulletin*, a paper on the subject states that there appears to be no reason why, as the outcome of the development of refrigerating machinery, bacon and pork products should not be raised in these islands to find a market in Europe and America. These markets have for some years been feeling the effect of a diminution of supplies, so that prices have advanced over 30 per cent. in the last five years. New sources of supply are urgently needed, and it is evident that the time is opportune for the West Indies to come forward as a furnisher to a market likely to be faced with somewhat short supplies for some time to come.

It is maintained that success depends upon entering the new enterprise on a large scale and on co-operative lines. It is suggested that companies might be formed to purchase pigs from growers on a profit-sharing basis, on similar lines to those on which the large sugar factory companies deal with sugar-canes and sugar.

Looking at the subject from a West Indian point of view, it is seen that there are many facilities for greatly increasing the number of pigs raised in these islands. Much land hitherto unsuitable for cane or cotton could be used for pig raising. In the matter of food supplies, provision crops of a diverse nature can be easily grown. Then there are many by-products and waste products that may be taken advantage of: for instance, molasses and filter-press cake from the sugar factories. Besides, we can add materials like bananas, coconut products, and many other substances which are now wasted. In considering the utilization of these materials in the way suggested, it should be remembered that the pig is the most efficient meat-making machine there is.

Turning to the animals themselves, it is stated in the paper that there would be no difficulty in raising in each island 20,000 to 30,000 pigs in a season. The best breeds would probably be found to be the Duroc-Jersey, Poland-China, Berkshire, and Tamworth. In regard to meat, it has been suggested that bacon produced in the West Indies may possess the defect known as softness. It is however well known that softness is a feature appearing not only in warm climates, but also in cold. Recent researches have appeared to have demonstrated that softness is largely traceable to the methods of feeding and that certain oily foods, such as some maize products and oil meal may accentuate this feature. Opportunity has recently been taken to examine the fat of pigs raised in several West Indian islands. The results appear to show that under present conditions of feeding, the fat tends to exhibit firmness rather than softness.

A BACON FACTORY IN RHODESIA.

To show that a factory similar to that proposed above can work successfully in a warm climate, the following article and abstract have been taken from the *Rhodesia Agricultural Journal* for December 1914.

The concern is run by the British South Africa Company. The pigs are bought up direct, not on a profit-sharing basis as has been suggested for the West Indies

It will be noticed that the factory is run on quite a small scale, which is an encouraging feature from the West Indian point of view:—

The new Bacon Factory is now in working order, and the products, we are pleased to say, have met with a very good reception. Pigs have been forthcoming fairly freely, but the capacity of the factory, which can deal with up to 300 pigs a month, has not yet been tested. The quality of the animals sent in has been very good, and so far only one beast has been condemned on account of disease.

The factory is a very substantial building, and the outer walls are of such a thickness that the interior is always cool. The main building consists of sticking pen, pigsties, slaughter house, picking house, sausage room, bacon washing house, smoke room, and office. The pigs are received at the factory siding and turned into an enclosed run. They are weighed straight off the truck and purchased by live weight. The pigs are afterwards turned into the sties, of which there are three, each capable of accommodating ten pigs. These sties are nicely completed with brick floors, and are well-drained, thus ensuring the acme of cleanliness. It may be mentioned that the refuse from the sties and the runs will be conveyed to the adjacent lands, which are to be placed under irrigation with a view to breeding and feeding pigs on the premises. The pigs are kept in the sties for twenty-four hours and are then passed into the sticking pen. Thence the carcases are conveyed by means of overhead tracking to the dumping table and the scalding tank. A clever arrangement lifts the carcase bodily from the tank on to the scraping table, where it is cleaned and disembowelled. From this point the pig is taken by means of the tracking to another weighing machine, where its dead weight is recorded. The backbone is afterwards taken out of the carcase and the two sides are placed in the chilling rooms.

The insulated chambers consist of the chilling rooms, air-lock curing cellar, and bacon store. These rooms are constructed in the most modern manner, and are capable of holding the required temperature for several days. The temperature in the chilling room ranges between 30 and 35 degrees, and it has a capacity for dealing with seventy-five pigs a week. The sides of bacon are hung on iron bars, and the process of chilling takes two days to complete. Passing from this room, the sides enter the curing chamber, where they remain fourteen days, subsequent to which they are smoked in the smoke room, and the bacon is ready for sale about eighteen days after the pig has been killed. The air lock referred to is a chamber between the chilling room and the curing chamber, and it is so arranged that when the main entrance door to the chambers is opened the hot air from without cannot penetrate into either the chilling or the curing rooms. This serves to maintain the temperatures in either room at a uniform degree. The walls of the chambers are insulated with charcoal.

What is required at the present time is more pigs. There is no doubt that in due course these will be forthcoming, and we feel sure that the breeding of pigs for the factory will be found a very profitable undertaking. The attached circular, issued by the Acting Commercial Representative of the British South Africa Company, gives full particulars as to the conditions under which pigs are received

at the factory, and we would advice farmers to carefully study it. In regard to feeding and general attention, these important factors are dealt with in Departmental Bulletin No. 169, which can be obtained upon application to the Department of Agriculture.

The circular referred to states that pigs are to be purchased at current rates, though a reduction will be made on all pigs that are found on killing to be soft or otherwise of inferior quality. All carcases have to be passed free from disease by a Government Veterinary Inspector. Payment for pigs is made monthly.

The type of pig required should be from 150 lb. to 200 lb. The most readily saleable are those having a good even covering of flesh with a large proportion of lean meat, thick and firm in the belly parts. Very fat, lardy pigs, especially those with an excess of fat on the back and on the inside of the belly, can only be used for second class produce. Sows that have raised litters, old sows, boars, old castrated boars or stags, can only be expected to yield third class or inferior produce. Prime bacon is produced from young sows or barrow pigs from seven to ten months old or thereabouts.

As regards sending the animals to the factory, marking is important. Ear-marking or clipping of the hair is recommended. The Manager of the Factory must be advised in advance of the number and full description of the animals to be despatched, how they are marked, and whether packed in crates or loose.

It is essential that animals intended for bacon purposes should not be bruised or knocked about, and when travelling they should be protected from the sun and heat. Overcrowding or overdriving should be avoided. Pigs should not be fed heavily immediately before being despatched to the factory; but if they are to travel long distances, water and a slight feed should be arranged for at intervals.

Method of Curing Bacon.—The following method employed in Wiltshire in the preparation of the renowned bacon of that county is given in *The Agricultural Note Book* by Primrose McConnel:—

'For a pig of 200 lb.: When the meat is cold and cut up, have it salted lightly and left on the stones for the night. Next morning brush off this salt, and well rub in a layer of salt and half a pound of saltpetre for each side of bacon of this weight, and have the saltpetre mixed with 1 lb. of coarse brown sugar for each side. Have it rubbed every day for three weeks, and then wash it all off, and have it sent to be smoked for a week or a little more. It is then fit for use. A pickle is generally made for the head, legs, etc., and any other small bits. Six lb. of salt, 1 lb. of saltpetre, 1 lb. of treacle, boiled for half an hour in 6 gallons of water, when cold to receive the pieces.'

In connexion with the article on radium and plant growth in the last issue of the *Agricultural News*, it is of interest to record that a note in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for November 1914, says that radio-active emanations have a marked action on alcoholic fermentations and yeast, exerting a stimulating action from the moment of inoculation of the medium and the growth of the elyptical yeast until the final stages. It is stated that this increased activity will be of great advantage in wine-making.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 6, 1914, with reference to the sales of West Indian Sea Island cotton:—

There has been a rather better enquiry for West Indian Sea Island cotton since our last report and about 150 bales have been sold, chiefly Nevis 13*d.* to 14*d.*, and St. Kitts 15*d.* to 16*d.*, also a few Montserrat at 14½*d.* and Old Crop Barbados and Antigua 12*d.* to 13*d.* Prices are quite steady.

About 150 bales of West Indian Sea Islands were lost in the 'Western Coast' which was torpedoed in the Channel.

The following is the report for March 20:—

Since our last report no business has been reported in West Indian Sea Island cotton.

The prices for Carolina Sea Island are now quite firm and with any improvement in the war position, we look for a good demand

---

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended March 20, is as follows:—

The early part of the week a cotton warehouse was burned, and 200 bales of Island cotton were destroyed. They consisted entirely of Planters' crop lots classing Extra Fine. This has reduced very much the limited unsold stock.

There has been a good deal of inquiry during the week for the crop lots, but at limits 1c. to 2c. below the views of the Factors, consequently the sales have been small. Otherwise the market is quiet, there being little demand for Fine and Fully Fine; the small stock however, is firmly held at quotations.

We quote, viz:—

Extra Fine 23c. to 24c. = 14*d.* to 14½*d.*, c.i.f. & 5 per cent.
Fine to Fully Fine 22c. = 13½*d.*, " " " "
Fine, off in colour 18c. to 20c. = 11½*d.* to 12½*d.* c.i.f. and 5 per cent.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, and Manchester, up to March 20, 1915, were 103 and 1,435 bales, respectively.

GUARANTEED MINIMUM PRICES FOR SEA ISLAND COTTON.

As this issue goes to press, a telegram has been received from the British Cotton Growing Association informing the Commissioner of Agriculture, that arrangements have been made with the Fine Spinners' and Doublers' Association, whereby minimum prices will be guaranteed for cotton for the crop of 1915-16. It is understood that 18*d.* will be paid for best qualities of St. Kitts and St. Vincent best ordinary, with higher prices for St. Vincent superfine. For other islands best quality, a minimum of 14*d.* will be paid.

In these circumstances the British Cotton Growing Association advise that there should be no reduction of acreage on plantations growing these qualities.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue forms a continuation of the one that appeared in the last, and gives the history of some of the agencies responsible for the introduction of West Indian plants and animals. Special consideration is given to Kew in this respect.

Articles dealing with sugar will be found on pages 116 and 117.

The recent suggestion of a bacon factory for the West Indies is considered on page 118.

Insect and Fungus Notes dealing with soil-inhabiting grubs and fungus control of scale insects, respectively, will be found on pages 122 and 126.

The International Institute of Agriculture in Relation to the Tropics.

At a meeting of the Permanent Committee of this Institute in Rome during December, the principal business done was the consideration of certain proposals brought forward by the Delegate for France in connexion with a report which had been presented at a previous meeting by the Delegate for Great Britain and Ireland on the Third International Congress of Tropical Agriculture. The *Journal of the Board of Agriculture* (England), for February 1915, states that the report of the British delegate had pointed out that in some tropical countries there appeared to be an impression that the International Institute confined its attention too closely to the interest of agriculture in temperate regions, and did not pay sufficient regard to tropical agriculture.

After some discussion the committee unanimously passed a resolution to the effect that the Institute will address all countries with a view to informing them of the obligations of the Institute towards tropical agriculture. It was resolved also that the Institute should put itself into communication with the International Association with a view to aiding and carrying out the resolutions passed by the International Congresses of Tropical Agriculture, and especially by the Congress of last year. The staff of the Institute was also instructed to study, still more thoroughly than hitherto, questions connected with colonial and tropical agriculture, to reserve for such questions a still larger portion of the bulletins, and to invite the interested Governments to transmit to the Institute fuller information on these subjects.

It is likely that the above resolution will result in the appearance of original articles in the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* concerning tropical agriculture. Hitherto these have dealt almost entirely with questions relating to temperate agriculture. With the exception of the attention given to India and Egypt, the same may be said of the *Monthly Bulletin of Economic and Social Intelligence,* which also we hope will now give more attention to tropical affairs.

Information Concerning Corn and the Lima Bean.

The question of the advisability for many reasons of paying more attention to the cultivation of food crops in the West Indies is one which has been brought prominently forward in the last few months, as the many articles on the subject which have appeared from time to time in the *Agricultural News* testify. In connexion with this subject two circulars have been recently issued with the object of drawing attention locally to the crops in question. The one of these, which deals with the cultivation of the Lima bean (*Phaseolus lunatus*), is a circular issued by the Imperial Commissioner of Agriculture, for distribution, through the various local Departments of Agriculture, to planters interested in the matter. This bean, most commonly known in the West Indies as 'White bean', is largely cultivated in California, and it might probably form a profitable crop in these islands. But as the circular points out,

experiments will have to be undertaken to settle several questions, in order to put the cultivation on a satisfactory basis. The situations in which the bean will best grow must be determined; whether the bush form or the climbing form is the most suitable; and, if the latter, whether supports must be provided, or whether it may be allowed to trail along the ground; what are the best distances apart for planting; what, if any, is the best machinery for use in the cultivation and the reaping of the crop. All these questions the circular suggests as affording room for practical and profitable experiment. The example of the way in which the cultivation of Sea Island cotton has grown to be a considerable industry in the smaller West Indian islands encourages the hope that a similar result may be obtained in the cultivation of the Lima bean. For as this bean is an article of world-wide use as a food both for man and stock, there is no likelihood of over-production, or of a sudden fall in the present average market price of 4c. per lb.

The second publication referred to above is a leaflet prepared by the Agricultural Superintendent of St. Vincent, for distribution chiefly among the peasant proprietors of that island, on the cultivation of Maize. It may be considered as supplementary to No. 76 of the Pamphlet Series lately issued by the Imperial Department, entitled Indian Corn, as it contains in simple language the chief points as to the best lines on which the cultivation of Maize may be tried in an island like St. Vincent, as recommended in that pamphlet. Considering that emphasis is laid on the advisability of growing a bean crop in rotation with Maize, the desirability of using the Lima bean in this way may be pointed out, especially if it should be found that the corn stalks may safely be left as supports for the running beans.

Carbon Dioxide and the Germination of Seeds.

An interesting review of a paper appearing in the *Proceedings of the Royal Society* is to be found in the *Agricultural Journal of India* for January 1915. It is pointed out in this, that the writer of the paper had previously determined the inhibitory action of carbon dioxide, especially in the seed itself. Germination can also be arrested by the carbon dioxide produced by decaying organic matter in the soil. Especial reference is made in the course of the review to the germinating power of Para rubber seeds. It is well known that in planting the seed under estate conditions, it is always desirable to put the seed in the ground within a fortnight. On this account some practicable method of extending the life of the seeds is desirable. It was found that bottling up the seeds with air in flasks gave far better results than the commercial method now in use of packing these seeds in a mixture of charcoal and ashes. It is suggested that the partial pressure of the carbon dioxide inhibits deterioration: the carbon dioxide is in fact in this case a preservative agent. The reviewer attaches much importance, as regards India, to the author's results in regard to green dressings which concern largely the production of carbon dioxide in the soil already referred to above.

Oil Content of Seeds.

The oil content of seeds as affected by the nutrition of the plant is dealt with in a paper in the *Journal of Agricultural Research*, Vol. III, No. 3. It is concluded that climate is a more potent factor than soil type in controlling the size of the seed and its oil content, probably because climatic conditions largely regulate those of the soil.

Within ordinary limits the relative fertility of the soil appears to be a minor factor in influencing the size of the seed and its oil content. In fertilizer tests with cotton, the addition of a complete fertilizer to an unproductive soil gave larger seed and a considerably higher percentage of oil. Application of increased quantities of nitrogen did not affect the size of the seed but lowered the percentage of oil. Increasing application of phosphorus or potassium did not affect either character. In pot-culture tests with soy beans, the addition of phosphorus did not change the size of the seed, but increased the oil content.

The Dutch Colour Standard.

In recent numbers of the *Agricultural News* (Vol. XIII, p. 407, Vol. XIV, pp. 3 and 35) reference has been made to the Dutch Standard as a basis for fixing the rates of import duties on sugars entering the Canadian market. It was explained in the last of the references above-mentioned that the Dutch Standard consists of a series of samples of cane sugar, ranging from a very dark No. 7 to an almost white product No. 25, which are prepared every year by two firms in Holland and sent to the various merchants and Customs depôts.

The colour standards as issued toward the end of 1914 were found to be darker than those formerly used, the result of this being that certain sugars which were formerly below No. 16 and are now above it by the change of standard, are heavily penalized by the increase of import duties in Canada.

The Canadian customs tariff makes the distinction in assessing duty on the No. 16 Dutch Standard, all raw sugars which are below being admitted with a duty some 50 to 60 cents per cwt. less than those possessing a colour corresponding to No. 16, or lighter than that. In the absence of this information the West Indian planters have continued to manufacture sugar up to the standard of previous years, whereas a darker product would have been required to meet the situation. Attention having been called to the matter, an investigation was made by the Canadian Minister of Trade and Commerce (Sir George Foster), with the result that official notification has been made to the effect that arrangements have been made by which, for the present, West Indian Sugars not over 16 Dutch Standard will be entered into Canada on the same basis as to Dutch Standard as prevailed in 1913. It should be mentioned that the *Canada-West India Magazine* was instrumental in giving prominence to this matter and advocating that the West Indian duties on sugar under the Canadian customs duties should be assessed on an unaltered standard.

INSECT NOTES.

SOIL-INHABITING GRUBS.

This is the season of the year when certain soil-inhabiting grubs which attack some of our West Indian crops are completing their larval growth and are about to emerge as adults.

These insects are of two general kinds: the root borers, *Diaprepes abbreviatus*, *Exophthalmus esuriens*, and perhaps other closely related species, and the hard back group including *Phytalus smithi*, several species of Lachnosterna and Cyclocephala.

Readers of the *Agricultural News* will remember that early last year (April 1914) the Leeward Islands root borer appeared in great numbers in one district in St. Kitts. The adult insects were found in a cotton field in such abundance that some 40,000 were reported to be captured in a short time. In an adjoining field, ripening cane plants were obviously suffering from some disease or pest, and examination revealed the presence of enormous numbers of the grubs of *Exophthalmus esuriens*, attacking the underground portion of the canes. This insect became abundant in lime trees at Montserrat on limes about the same time, and at Antigua a month later. The injury caused by the adult beetle is not very severe. The root injury caused by the grubs may be considerable in the case of limes as in sugar-cane.

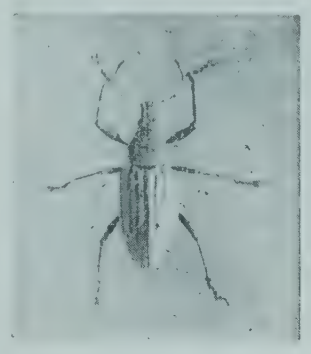


Fig. 1. *Diaprepes abbreviatus.*

Diaprepes abbreviatus, which is the root borer of sugar-cane in Barbados, occurs in several of the West Indian islands where it may be a pest of sugar-cane, limes or cacao. Of the hard back grubs which are known to be or are believed to be injurious to growing plants, it is likely that in each island one or more species will be found. In St. Kitts, the small brown hard back, *Lachnosterna patruelis*, is abundant in the cane fields of certain districts. In Antigua, *Lachnosterna* sp., a slightly larger brown hard back, is known as a pest of Indian corn and young cane plants, and it has in one instance at least proved destructive in onion cultivation. In the Windward Islands there are several species of Cyclocephala and Leucothyreus which occur as hard back pests of various crops.

The adults of the root borers, Exophthalmus and Diaprepes, after emergence take refuge among the foliage of plants. Exophthalmus may be looked for among the leaves of lime trees, pigeon peas, castor plants, and French cotton, while Diaprepes hides in the corn, sugar-cane, and amongst the foliage of other plants which may grow in or near the sugar-cane fields.

The larvae of these two beetles feed on the roots of plants of many kinds. At this time of the year those in the cane field will be found in the underground portion of the cane, where they are eating the inside part of the plant.

The hard back beetles are more difficult to find as they come out from the soil during the night and burrow down again and remain buried during the day. The hard back grubs will be found in the soil amongst the roots of cane and corn, probably pretty close to the plant and not very much out in the banks.

Both the root borer weevils and the hard back beetles eat the leaves of plants to some extent, and their presence is often revealed by leaves with ragged edges, and with holes eaten through them.

This is the time to keep a careful watch for the occurrence of these beetles. In any cane field in which canes have appeared to be dying of drought just before ripening, careful examination should be made for the grubs of these beetles, and if they occur there, the stumps should be dug out as soon as the canes are reaped and broken up so that the birds, ants, and toads may have an opportunity of getting at them.

Fig. 2. *Exophthalmus esuriens*; the adult.

Where these signs are seen, search should be made among the foliage for the root borer adults, and in the soil near the base of the plants for the hard backs.

A little later, probably with the first rains, the adults will be emerging, and as they are seen, regular collections should be made in order to prevent egg-laying as far as possible. The planter should know which fields the beetles are coming from and should make vigorous efforts to prevent the infestation of any others, by collecting and destroying the beetles, by digging the stumps and exposing the grubs or collecting them. The eggs, also, of the root borers may be collected, since these are often deposited in situations where they may be easily found. These eggs are laid on leaves of cane, corn, castor, etc., and they are covered from view by means of a bit of leaf stuck down over them. The figure shows the general appearance of the root borer eggs and their arrangement on the leaf.

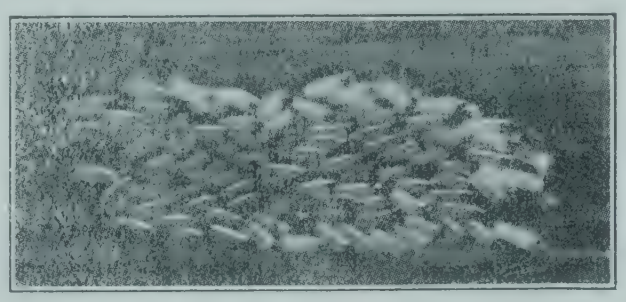


Fig. 3. *Diaprepes abbreviatus*; the eggs.

The collection of the root borer beetles and their eggs is a very useful practice when they occur in abundance, and it is quite easy to train young boys to find them readily. When they have once learned how to search and where the beetles hide and where the eggs are deposited they become very proficient. Many planters do not have this kind of work performed because they think that if their neighbours do not co-operate in the practice, no good will result. It is of course desirable that collecting should be energetically carried on throughout each infested district during the season of emergence of the beetles and of egg-laying. Much may be accomplished, however, by any individual planter working alone.

Fig. 4. *Phytalus smithi.*

In the case of the hard back the matter of collecting the adults and eggs is more difficult, but the grubs may be collected easily and often in large numbers from fields of Indian corn, and a fair degree of control may be maintained in this way.

H.A.B.

VETERINARY NOTES.

SKIN DISEASE OF CATTLE IN ANTIGUA.

This article is a summary of the observations made by Mr. P. T. Saunders, M.R.C.V.S., A.V.C., formerly Veterinary Officer to the Imperial Department of Agriculture. A paper comprising complete information on the work done in connexion with the investigation will appear in the next number of the *West Indian Bulletin*.

Skin disease of cattle in Antigua is regarded as identical with that known as *farcin du boeuf* in the French island of Guadeloupe. In Antigua it is technically known as Leucodermatitis. Most animals may be affected by the complaint, but it is principally confined in Antigua to bovines. At the present time the disease is less prevalent than it was in former years, and it is likely that it will be eliminated by the practice of spraying for ticks. As regards duration of the disease, death may ensue in some cases in as little as three weeks after the first symptoms become apparent. Where the termination is to be favourable, a cure may be effected in the same time, but it is generally three or four months before a well-established case can be considered cured. Nothing is known definitely as regards the means of infection, though there is reason to believe that in Antigua the causative organism or organisms are carried by the gold tick, or gain entrance through mechanical wounds. There is no particular immunity to be observed, and predisposition does not appear to be an important factor.

As regards the causative organism, a considerable amount of work was done to find out its nature and identity. The inoculation of several guinea pigs showed fairly conclusively that the causative organism is not carried in the blood of the diseased cattle. It was naturally thought that the parasite must therefore exist in the skin, and an examination resulted in the isolation of several genera of fungi, two of which might from their systematic position be considered possible exciting causes. Unfortunately it was not possible to obtain cattle with which to inoculate with these fungi. The injection of the fungi into guinea pigs did not produce death. Microscopic examination of the skin of diseased cattle displayed an interesting morbid condition, but evidence of parasitic fungi was not indubitably demonstrated.

There are two kinds of lesions to be recognized in skin disease—violent eruptive, and dry. A full technical description of these will appear in the *West Indian Bulletin*. As regards diagnosis in the early stages, the raising of the hair in tufts and subsequent matting is a useful aid. Later the presence of patches of skin of spongy appearance, and denuded of hair, is sufficiently characteristic; while in the later stages the horny scabs, the maintenance of appetite and condition, and the absence of a specific bacterial agent in the blood or pus, render diagnosis easy.

It would seem that the treatment adopted in Antigua for this disease has been rather crude and inefficient. It is suggested that in place of tallow and vinegar applications, or dressings with a basis of oil (which simply checks skin respiration), mercury and iodine should be employed. Arsenic would also appear to be useful, and a combination of arsenious acid and mercury such as Donovan's solution, is well worth trying. What is wanted is a compound which will penetrate the skin and make the condition therein unsuitable for the life of the supposed fungus parasite. Spraying with the compound suggested, or even with an ordinary arsenic spray mixture, would appear to answer this purpose. Finally attention may be called to the importance of sanitation of pens, shelter from the sun, and change of pasture. Overstocking should not be allowed.

LIVE STOCK IN ST. VINCENT.

There is a tendency, when control has been exercised efficiently for a number of years, to underestimate its value. Only when the control is removed, or suddenly overcome, is the benefit of it fully appreciated. An example of this is afforded by the outbreak of two cases of anthrax in St. Vincent last year. It emphasizes the importance of veterinary control in connexion with domestic animals in that Colony. The nature of this work is briefly dealt with in the following report of the Government Veterinary Surgeon, for the year 1913-14. The report also gives useful information concerning the exportation and importation of live stock:—

EXAMINATION OF EARS.

During the year 851 ears and 285 blood smears, made by the police constables at Georgetown and Colonarie, were forwarded to the Laboratory.

Only two cases of anthrax were diagnosed during the year. Both of these occurred in cattle pastured at Pauls, situated at the back of Kingstown. Immediately these cases were discovered, the owner of the pasture was interviewed and, as a result, the owners of all bovines renting pasture at Pauls were notified that if their animals were not submitted for vaccination within twenty-four hours, they would have to be removed. This had the desired effect, for all animals pastured within a certain radius of the infected area were artificially inoculated, and up to March 31, no more cases had occurred.

It may be interesting to state that these cases occurred immediately after a heavy rainfall. Pauls is particularly favourable to the growth and spread of anthrax, the land being low-lying, swampy, and shaded. I have been led to understand that previous to the measures adopted by the Government for the control of this disease, anthrax carcases were often flayed on this pasture. Although there does not appear to be any fear of the disease assuming an epizootic form, it is reasonable to expect that cases will occur from time to time.

VACCINATION.

During the period under review 1,868 animals were inoculated with single anthrax vaccine, as a precautionary measure. The use of this single serum has entirely replaced the double serums formerly used.

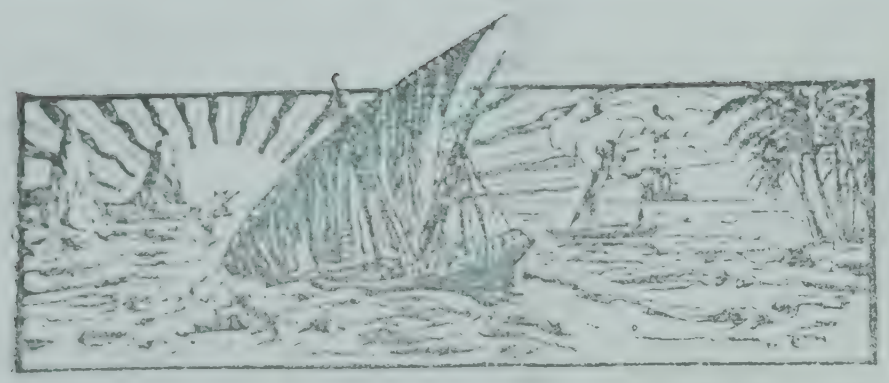
EXPORTATION OF LIVE STOCK.

Certificates were granted for the exportation of 383 head of live stock to the neighbouring colonies of Barbados, Trinidad, Grenada, and St. Lucia. This does not cover the Colony's entire export trade in live stock, as sheep, goats, and pigs exported to Trinidad, as well as animals from the Grenadines, do not come under the observation of this Department.

IMPORTATION OF LIVE STOCK.

Four steamers and twenty sailing vessels were boarded, and fifty-one animals examined. The animals examined, and the ports from which they arrived, were as follows:—

7 cattle, 3 horses, 5 mules, 5 goats, 4 pigs from Barbados,
1 bull and 2 pigs from Trinidad,
1 horse, 1 mule and 3 pigs from Grenada,
1 cow and 2 horses from Carriacou,
2 cattle and 1 horse from St. Lucia,
12 sheep (rams) from Canada, and 1 horse from the United States of America.



GLEANINGS.

Press Bulletin No. 48 of the Hawaii Agricultural Experiment Station deals with the suppression of weeds among pine-apples by arsenite of soda spray. In demonstrations this substance proved successful, but it is not known yet whether continual use may result in some injury to the fruit or to the soil.

The *Colonizer* for January 1915 refers to the Annual Report of the Government Geologist of South Australia, which contains interesting information concerning the radium-bearing districts of that State. It is interesting that two main radium-bearing districts occupy positions which are approximately centrally situated within regions containing copper lodes.

A report from the acting Curator for the Virgin Islands states that the weather during February was very dry, and the cotton and limes particularly suffered from this want of moisture. The young coco-nut fields however have made satisfactory growth and do not appear to be greatly affected. Efforts are being made to extend corn cultivation, and to organize an onion-growing association.

An appreciative article on the Barbados cherry (*Malphigia glabra*) appears in *Modern Cuba* for February 1915. It is stated that the plant responds best in a mellow loam or rich garden soil, and if kept trimmed low, furnishes an ornamental shrub for the lawn, though it sometimes attains a height of 20 feet. It may be added that this plant is a suitable one to use in the matter of hedge making.

A note on vegetables in British Guiana appears in the *Garderners' Chronicle* for January 30, 1915. The rather feeble suggestion is made that as some of the English vegetables succeed in British Guiana, it may be that British Guiana vegetables might prove successful in England. Lima beans (*Phaseolus lunatus*), and bonavist beans (*Dolichos lablab*) are mentioned in this respect. It is stated that Lima beans have already been tried in England, but with what success it is not made known.

In Kentucky, as a rule, the soils of the better agricultural areas contain much larger amounts of manganese than those of the inferior areas. A note on the subject is to be found in the *Experiment Station Record* for December 1914, which deals with the relation between phosphorus and manganese content of soils; the majority contain more manganese than phosphorus. The surface soils contain more manganese than the subsoils do.

The Administrator's opening address to the Legislative Council of St. Vincent in the March session of 1915, contains a reference to the importance of maintaining the present agricultural staff in the island, if not of increasing it. His Honour also made reference to the prospects of a corn-growing industry in the Colony, which are promising in view of the close co-operation between the Imperial Department and the St. Vincent Government.

Steps are being taken by the Imperial Institute to secure for England trade based on raw material which was previously in German hands. The Imperial Institute is conducting this policy in regard to senna. Communication between the Institute and the chief British importers and the Egyptian Government has resulted in the prohibition of the export of senna from Egypt to any country other than the United Kingdom and France.

From the Annual Report of the Education Department, Jamaica, 1913-14, it is observed that not as much success as might be expected has been attained in the matter of school gardens. It would seem that in Jamaica and in most other colonies, the best system of instruction for elementary schools is a definite course of box and pot work, leaving school gardening as generally understood to secondary schools, where the supervision of a specially trained master is permanently available.

A new feature of the Imperial Institute has been the establishment of a Technical Information Bureau. In addition to the work of examining samples of colonial products with a view to their commercial utilization, the institution makes a special feature of the continuous collection of information relating to them from all sources, and this store of knowledge forms the basis of the new Bureau, which is prepared to answer enquiries on all matters relating to raw materials and their utilization.

A novel 'spray-adhesive' is described in the *Gardeners' Chronicle* for February 6, 1915. It is claimed that an excellent adhesive for zinc arsenite sprays can be made by steeping sliced prickly pears, *Opuntia* sp., in water. The mucilaginous extract obtained in this way is said to increase the adhesiveness of the spray fluid, and it is recommended to use for this purpose the extract obtained by soaking for a night 15 lb. of sliced pear in 50 gallons of water. This amount is mixed with 3 lb. of zinc arsenite.

What promises to be one of the most progressive of the secondary school magazines has recently been published by the Boys' Secondary School, Grenada. As well as information relating to the work of the school itself, the journal contains a suggestive article by Mr. Hedog Jones, M.A., Head Master and Editor, on agricultural education in Grenada, in which he emphasizes the necessity of bringing the teaching of the primary schools into a more direct connexion with that of the secondary school.

It is noted in the *Journal of the Chemical Society*, Vols. 107 and 108, that the acid tissues of citrus fruits contain oxidases, which are evidently protected in some way from the action of the acid. It is suggested that the protection may be afforded by a semi-permeable tissue through which the acid cannot pass. It seems evident that the membranes are not normally permeable to acid, because lemon seeds frequently germinate while in the carpels; in lemon juice, even when several times diluted, they fail to germinate.

STUDENTS' CORNER.

Seasonal Notes.

These notes on the breeding and management of the pig are presented with the object of arousing the students' attention to what may develop into an industry of considerable importance. Reference to another article in this issue will show that the best breeds for the West Indies, especially for the production of bacon, are the Duroc-Jersey, Poland-China, Berkshire, and Tamworth.

As regards the selection of animals, it may be stated that in a general way the body of the boar should be thick set but not coarse. The shape of the head should be noted, as well as the disposition and prolificacy of the animal. The sow ought to be wide across the shoulders, long from neck to tail, and the whole body large. There should be a large number of teats, and their nearness to the forelegs is indicative of a good suckler. The feel of the flank is important.

Pigs should be mated at about eight months and the litter of about twelve may be expected which should be weaned at six weeks.

As regards feeding, Indian corn is a good foodstuff, but it should not be given to a very young animal, as it is apt to produce irritation of the stomach. For a half-grown or full-grown pig, Indian corn meal should be well boiled. In regard to the feeding of Indian corn to pigs, see the note in the *Agricultural News*, present volume, page 53. Other foodstuffs produced in the West Indies suitable as pig food are molasses, and filter-press cake. Sugar-cane under present circumstances is likely to prove too valuable for this purpose, unless grown in places where it cannot be conveyed to sugar factories. As well as sugar products there are materials like bananas, and coco-nut products, which may be fed economically. Fattening should commence immediately after weaning, though every attempt should be made to encourage the young animals to consume artificial food of an easily digestible kind as early as possible.

A comparative test is being made of the Washington navel and Valencia oranges and the Eureka lemon grown upon sweet, sour, and trifoliate orange stock and upon pomelo. As determined by the results thus far secured it appears that varying soil conditions may modify the influence of various stocks on oranges and lemons. A marked dwarfing of lemon trees grown on trifoliate stock was noted in every instance. There was also an increased diameter on the trifoliate stock below the bud union in practically all cases. In point of fruit production the navel orange appears to yield best on sour stock, followed by sweet, with Trifoliata stock third. In case of the Eureka lemon, pomelo was the best stock with sour, sweet, and Trifoliata following in the order named. (*Experiment Station Record*, Vol. XXXII, No. 3.)

RUBBER CULTIVATION IN MALAYA.

The above is the title of an interesting paper read by Mr. L. Lewton-Brain, Director of Agriculture, Federated Malay States, at the International Rubber-Congress held recently in Java. The paper supplies information as to the manner in which the Para rubber tree *Hevea brasilinsis* is planted and cultivated, and its product prepared in Malaya, based mainly on the replies to a series of questions sent out to Estate Managers, and his own observations in travelling around the country, together with the results of experiments carried out by the Department of Agriculture.

Rubber lands in Malaya may be divided broadly into two classes: those composing the undulating and hilly lands of the interior, and the alluvial clays of the valleys and coast districts. Both classes of land are said to have their advantages and disadvantages. The flat lands, for instance, require extensive drainage to fit them for rubber planting, which makes opening up a more expensive and difficult task than on the undulating lands, where only the felling and clearing of the jungle have to be undertaken before planting can be done. On the other hand, once the flat lands are opened up they are, generally speaking, easier to manage than hilly country, roads are more easily planned and made, and the labourer employed in weeding, cultivating or tapping can cover a greater area in a given time. The choice then between a thoroughly well-drained coast estate and a gently undulating one inland, depends, in the opinion of the writer, on other factors such as the supply of labour, health of the situation, and accessibility to railway or seaport.

It is pointed out that the success of Malaya, as a rubber-planting country has been greatly helped by the uniformity of its climate both as regards temperature and rainfall: there is no cold season and no dry season. Generally speaking, the annual rainfall may be said to vary from 80 to 100 inches.

As regards planting, it would appear that up to the present very little has been possible in the way of selection of seed, although it is fairly evident that planters realize the necessity for some kind of seed selection. Practically all the seed sown is derived from other places in Malaya—in one or two cases some has been imported from Ceylon. Conflicting opinions exist as to the best planting distance, some planters favouring 20 × 20 feet, others 30 × 30 feet. Mr. Lewton-Brain expresses his belief that original wide planting will eventually be adopted generally, giving forty or fifty trees to the acre.

The principal questions that arise between the time of planting and coming into bearing of the rubber relate to catch crops, clean weeding or cover crops, and cultivation, liming and manuring. The weight of opinion is said to be very strongly against catch crops. With regard to the question of clean weeding *versus* cover crops, there is found to be a remarkable unanimity of opinion in favour of clean weeding due, it is believed, to one weed: Lalang (*Imperata arundinacea*)—a grass that very quickly establishes itself in the soil and, once established, is extremely difficult and expensive to eradicate: its effect on the growth of rubber is disastrous. Notwithstanding, Mr. Lewton-Brain is strongly convinced that cover crops would be of very great benefit on most rubber clearings. The form of cultivation in vogue on a good many estates in the flat country is forking or 'changkolling' to a depth of 4 to 6 inches, once or twice a year; this materially improves the texture of the soil, especially if combined with liming. There has been very little experience of manuring, most of the estates consisting of virgin land.

Four years after planting, the rubber tree under conditions obtaining in Malaya should be ready for tapping. The favourite system of tapping, on first opening up a tree, is that known as the 'Basal V', that is one cut on each of two adjacent quarters starting at about 20 inches from the ground level. Experience has shown generally that this method results in the best yield of rubber, and has less injurious effects on the tree than any other. As regards the method of tapping, the excision of bark is the only one seen in Malaya, the tools in use being the gouge, jebong, and farrier's knife. To collect the latex, glass or porcelain cups are very generally used. In the manufacture of the rubber acetic acid is mostly used as the coagulant; formic and sulphuric acid have both been tried. Artificial methods of drying are said not to have found much favour in this country.

FUNGUS NOTES.

THE EFFICIENCY OF FUNGOID PARASITES OF SCALE INSECTS.

II

Having considered the influence of weather conditions on the natural occurrence of scale-destroying fungi, there remains to be discussed the question as to how far their efficiency can be increased by artificial distribution. As a consequence of the success, since shown to be due to very special circumstances, of the introduction of Australian lady-bird beetles into California to prey on the cottony cushion scale, a very large amount of attention has been given to the question of natural enemies of injurious insects. The results have been usually disappointing, but the rules of the game are now pretty clear. The rapid increase of a pest which may take place when it is newly introduced into a country where natural enemies adapted to destroy it are few or absent, may be checked in some cases by bringing in such enemies from countries where they exist. To use a relevant illustration: should some kind of white fly become troublesome in the West Indies, it would be worth while to introduce the fungi which are parasitic on certain species in Florida, in the hope of their exercising a check on the insect in these islands. Were the experiment successful, the control might be more efficient or less so than it is in Florida, according to the extent to which the conditions favoured the fungi. It would not be expected to be complete. The point is, that once given a start, the fungus parasites might establish themselves and constitute permanent factors modifying the activity of the insect.

When such a factor is already well established in a country, and it is desired to increase its effect, the element of artificiality becomes much greater. The fungus (and the same applies to other parasites) already has its place, its settled lines of action, so to speak. By cultivating it, by distributing it, it may be increased for the time, but when such means are no longer used it will settle back to much its old position, which is determined by natural conditions and changes only in response to their fluctuations. This has been and is the situation with regard to most work on the fungus control of insects.

The method has an insidious appeal, in that it seems to promise to the planter a self-acting remedy, but experience shows that, as might have been expected, results are not to be obtained without an adequate amount of trouble.

The use of the fungi does afford an alternative to the employment of poisonous sprays, but save that in the one case a living organism is used, one method is as artificial as the other, and it depends entirely on the particular circumstances of the case as to which is more efficient or less troublesome. That is a question for the entomologist and for the planter. In Florida, in connexion with white fly control, each method has its advocates. In Trinidad, where periodic dusting with fungus spores is in use against froghopper on sugar-cane, it would appear that spraying with insecticides is out of the question.

In one respect the use of fungi has a disadvantage as compared with the use of poisons. The latter may be applied with advantage at the beginning of an attack, the former do not become very effective until their hosts are plentiful. Like all fatal parasites, they tend to cut their own throats. The more thoroughly they kill off their hosts, the less material they have to live upon. When the chances of infection have been thus reduced, the surviving insects, or colonists from another area, start a fresh wave of insect infestation, which in time is again overtaken by the rising numbers of the parasite.

This succession is perhaps most easily seen in the West Indies in the action of the shield-scale fungus working on more or less isolated trees. In lime plantations it takes place in sections of the cultivation rather than on individual trees.

Several observers agree that in the case of white fly control in Florida, the parasites under favourable conditions, and without artificial aid become effective about every third year.

It was pointed out in the first part of this article that in certain districts among the Lesser Antilles, conditions are so favourable to the spread of scale fungi that the matter may be left to itself. What can be done in the districts not so favoured? Unless there is at some period of the year a season when the fungi, if they are present, can be observed to become active, it is not worth while to trouble about them. If they are not present at all, it is at least possible, since they are so well distributed through the islands, that the conditions are not favourable. Where they have a period of valuable activity in the wet season, followed by comparative scarcity in the dry, something may be done. It will be found that while they disappear from view in exposed situations, they continue a visible existence in damp and sheltered places. The spores of most of our species do not appear to be very resistant, and it is probable that it is from such places that the spread begins when conditions become favourable. By distributing the material thus available, or by taking material from the earliest plants to become infested, it is probable, and has often been definitely claimed, that the progress of the fungus may be considerably hastened. Especially is this the case with isolated trees.

Various methods are available in making use of such material. Branches from the fungus-infested tree may be tied among the leaves of the tree to be infected. Leaves bearing the fungus may be dipped in water and rubbed on the leaves bearing the scales, or pinned in contact with them. The material may be stirred up in water to wash off the spores, or ground up and mixed with water in the case of leaves.

This mixture may be sprinkled on to the trees with a brush, or the twigs bent down and dipped into it, or it may be applied with a syringe or other type of sprayer after being strained through a wire sieve. Cloth strainers keep back the spores. Brass or copper sprayers may be used if they are clean and the material is not allowed to stand very long in the tank.

Comparative trials of these methods have not been made in the case of the West Indian species. Drs. Morrill and Back (Natural Control of White Flies in Florida: *Bull. 102, Bur. of Entom.*, 1912) favour the spore-spraying method for distributing the Aschersonias there concerned.

The condition of the material used would appear to have more influence on successful introduction than the method of its application. It should be used as fresh as possible, and in the active spore-producing stage, recognizable on examination with a pocket lens. In the case of the shield scale fungus, a powdery glistening appearance denotes the presence of the spores. In the red- and white-headed fungi, the loose tufts of ripe spores can be easily made out.

The common occurrence of such fungi on potted plants suggests that these might in some cases be used with advantage. When a branch or twig is tied into a tree, the immersion of the cut end in water contained in a narrow-necked bottle is an obvious benefit.

The caution must be repeated that all these measures depend entirely for their success on the conditions being right for the development of the fungus. In dry weather they are useless. Moreover, experiments have shown that once a fungus has been given a general start, attempts to increase its efficiency by further spore-spraying often have little visible effect.

The possibility, in some situations, of altering the conditions so as to favour fungous control by providing windbreaks or other forms of shelter should not be lost sight of.

Caution should be observed in making use of infested material lest scale insects not already present on the plants should be introduced. Leaves of grape-fruit recently collected, on which the scales were well infested with three species of fungi, nevertheless had numbers of the young of the mussel scale crawling over them more than a week after they were picked and dried.

W.N.

CELLULOSE FROM THE BAMBOO.

In view of the fact that some attention is being given in Trinidad to the utilization of the bamboo as material for paper making, considerable interest attaches to a communication made by Mr. William Raitt, Cellulose Expert, Imperial Forest Research Institute, India, to the Eighth International Congress of Applied Chemistry. In the article under consideration it is stated that it has been proved that bamboo cellulose is suitable for the manufacture of paper, especially for the printing and litho grades, provided its isolation has been successfully accomplished. Previous to the investigation with which the article deals, some divergency of opinion existed in regard to the possibility if utilizing nodes and certain operations connected with isolation.

The writer refers to Mr. R. S. Pearson's work in connexion with the species of Bambusa suitable for paper-making material in India and Burma. Out of some hundred different species, only five were found to be suitable, namely, *B. Tulda*, *B. arundinacea*, *B. polymorpha*, *B.* [Cephalostachyum] *pergracile*, and *B.* [Melocanna] *bambusoides*. These are the only species which exist in commercial quantities and under economically exploitable conditions. Though few in number, these species are each so dominant in its own area that they probably represent 80 per cent. of the whole growing stand of bamboo in the country.

The point next dealt with is the difficulty of distinguishing bamboo stems of different ages. The writer then proceeds to consider the digestion of the stems. It is stated that the material has an undesirable tendency to float. Its resistance to penetration and the variation of this in accordance with the size of the chip is indicated. Also there is the variation in this respect in accordance with age, a charge of mixed age being invariably irregularly digested.

A bamboo column is light and buoyant solely because it is hollow. Its component wood is really as heavy as many of our commercial hardwoods. Its actual specific gravity varies somewhat with species, that of the lightest of the five species we are concerned with being ·8410 for internodes, and ·8091 for nodes, while the heaviest is ·9555 internodes, and ·9170 nodes. Bomboo is therefore of about twice the specific gravity of the common pulp woods, spruce and fir—a fact which when realized in all its bearings, throws considerable doubt as to whether we have been right in treating it on similar lines as wood so far as its preliminary preparation for digestion is concerned.

A marked microscopic feature of bamboo is the large vessels which run continuously from top to bottom of the stems. These do not collapse in drying, but retain their full size and shape, and consequently their air-carrying capacity. Dry bamboo is therefore largely impregnated with air in a state of capillarity—a condition which makes it somewhat difficult to expel, and which fully accounts for the tendency to float, which is one of the chief difficulties in its digestion. Digestion difficulties are therefore due to resistance of the capillary air and to a mass or structural resistance to penetration of liquor varying with the size of the individual chip. The smaller the particles and the more regular their size, the better will be the results. Some light is thrown upon resistance by a chemical examination of the stem. It was found that lignification begins with the sprouting of the branches which occurs when the culm is three-fourths grown, and is complete at one year old, little or no change in this respect happening afterwards. At the half-grown stage, the plant is wholly pecto-cellulose in character. With the rapid increase in lignin at maturity, there is a corresponding reduction in pectose, but with advancing age a gradual increase in the latter at the expense of the starch group. The plant is distinctly of a pecto-ligno-cellulose character.

The investigation into the amount of caustic soda needed for digestion showed that the whole stem, nodes included, when suitably crushed, will digest satisfactorily with a theoretical 17½ to 18 per cent. of NaOH, and it makes no difference whether it is one or three years old, and in the produce there is absolutely no indication whatever of the nodes. It is pointed out that under normal conditions of digestion, pectose gelatinizes, and probably resistance is set up; but crushing counteracts such action in the case of bamboo.

One of the remaining difficulties is connected with the starch content of the plant, and its effect upon yield of cellulose and also on the bleaching results. It was found that starch in the bamboo is capable of being oxidized by air and dispersed in the atmosphere, and that such oxidation is an integral part of the process of seasoning. This has led to the conclusion that the maximum yield of cellulose can only be obtained from bamboo which is not merely dry, but is also *seasoned*. The influence of the starch content upon bleaching is due to the results of the combination between it and NaOH which occurs under the digestion conditions of strong liquor and high temperature. This does no harm if it were not for the fact that the secondary starch contains an insoluble dark-brown precipitate, which is unbleachable within economic limits. This was removed satisfactorily by means of the sulphite process. A 1-per cent. solution applied in simple cold steeping to the unbleached pulp produced by NaOH, dissolved out of it a large quantity of dark-brown colouring matter, leaving it several shades lighter in colour and much more bleachable.

In conclusion, the objections that have been made to bamboo as a paper-making material, and the difficulties hitherto met in their treatment as described in the above article can be met in the following ways: (a) seasoned bamboo only to be used; (b) raw material to be crushed; (c) water soluble matter to be extracted previously to digestion; (d) digestion with sulphite liquor. It is pointed out that the foregoing refer only to the five species of India and Burma, and may not prove altogether applicable to the bamboos of other species grown elsewhere.

MARKET REPORTS.

London.—The West India Committee Circular, March 9, 1915.

Arrowroot—1¾*d.* to 4¾*d.*
Balata—Sheet, 2/4½; block, 1/11½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 90/- per cwt.; Grenada, 83/6; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £28 to £28 5*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 12*d.* to 16*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 2/6 to 2/9; concentrated, £21; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations
Mace—9*d.* to 2/11*d.*
Nutmegs—4¼*d.* to 5¾*d.*
Pimento—Quiet.
Rubber—Para, fine hard, 2/5; fine soft, 2/2; Castilloa, 2/-.
Rum—Jamaica, 2 4

New York.—Messrs. Gillespie Bros., & Co., July 24, 1914.

Cacao—Caracas, 11½c. to 12c.; Grenada, 11c. to 11½c.; Trinidad, 11¼c. to 11¾c.; Jamaica, 10c. to 11c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $21·00; culls, no quotations.
Coffee—Jamaica, 9¾c. to 13½c. per lb.
Ginger—7½c. to 10c. per lb.
Goat Skins—Jamaica, 46c.; Antigua and Barbados, 43c. to 46c.; St. Thomas and St. Kitts, 40c. to 43c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$3·75 to $4·50.
Mace—45c. to 53c. per lb.
Nutmegs—110's, 11¾c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—3⅞c. per lb.
Sugar—Centrifugals, 96°, 3·26c.; Muscovados, 89°, 2·88c.; Molasses, 89 , 2·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., March 22, 1915.

Cacao—Venezuelan, $16·75 to $17·00; Trinidad, $16·25 to $16·75.
Coco-nut Oil—93c. per Imperial gallon.
Coffee—Venezuelan, 11c. per lb.
Copra—$4·50 to $4·75 per 100 lb.
Dhal—No quotations.
Onions—$3·75 to $4·10 per 100 lb.
Peas, Split—$9·75 per bag.
Potatoes—English $1·30 to $1·40 per 100 lb.
Rice—Yellow, $6·25 to $6·30; White, $6·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. T. S. Garraway & Co., March 8, 1915.

Arrowroot—$4·00 to $4·50 per 100 lb.
Cacao—$13·00 per 100 lb.
Coco-nuts—$16·80.
Hay—$1·75 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $82·00 per ton.
Molasses—No quotations.
Onions—$5·75 to $6·00 per 190 lb.
Peas, Split—$12·75 to $13·31; Canada. no quotations.
Potatoes—Nova Scotia, $3·25 per 160 lb.
Rice—Ballam, $6·10 to $6·25 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, no quotations.

British Guiana.—Messrs. Wieting & Richter, February 6, 1915; Messrs. Sandbach, Parker & Co., March 19, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	14c. per lb.	14c. per lb.
Cassava—	$1·08	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	——	16c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	16c. per lb.
Liberian	10c. per lb.	10c. per lb.
Dhal—	——	$6·75 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	——
Peas—Split	——	$13·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 40c.	——
Potatoes—Nova Scotia	$2·25 to $2·40	$2·25
Lisbon	——	——
Potatoes--Sweet, B'bados	$2·16	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
Tannias—	$2·16	——
Yams—White	——	——
Buck	$2·04	——
Sugar—Dark crystals	$3·40	$3·50
Yellow	$4·00 to $4·10	$4·00
White	$5·10 to $5·25	——
Molasses	$2·90	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Individuality in Cacao Trees.

THE Trinidad observations* concerning the natural yield of cacao plots open up a subject which seems deserving of special consideration. The study of the natural yields of certain plots in that island has now been carried on for two years, and the object in view is to arrive at some definite idea of the extent to which individual groups of trees vary naturally asregards productiveness under similar conditions of environment. It is maintained that without such knowledge, the results of manurial experiments are often misleading and the conclusions unreliable. The figures published by the Trinidad Department of Agriculture already show that the variation between the different plots on each estate may be considerable. For instance, on a plot on one estate, in 1912-13, the average number of pods picked per tree was 31·21, whilst in another plot near by, the number was only 8·52. In 1913-14, the first plot yielded 42·26, and the second, 17·38. It will be observed that there was a general increase (due to season), but the relative productiveness in this case was maintained. It is clear that if the high yielding plot were manured and the low yielding used as a control without knowledge of the natural yields, most erroneous conclusions as to the effect of manures might result. So far as is shown by the limited figures available, the ratio between the productiveness of any two groups of trees is not altogether constant. In fact the higher yielding plot in one year may be the lower yielding the next. This, however, is more or less exceptional, and as a general rule it may be stated that *with trees of the same age and condition* the tendency for a group of trees to produce a certain yield is constant, though several years' trials are required before the average yield can be determined.

The principle underlying natural yields in relation to manurial experiments is that plots should be tested before they are manured. This means the study of the trees individually, and as a consequence a doubling of the time required before perfectly reliable manurial results can be forthcoming. There is one feature of manurial experiments with untested trees, however, that to some extent constitutes a safe-guard, and that

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is the continuation of the experiments over a number of years. If, as in the Dominica experiments * a gradual increase takes place in the treated plots of mature trees, it may be fairly concluded that this increase is the result of the manurial treatment, since individuality is a constant factor and would not show its effect in the form of a steady rise. In manurial experiments where an increase is shown in the first year and continues to remain at the same level, it is more likely to be the effect of individuality than in the former case. An approximate idea of the value of manurial treatment can frequently be obtained in spite of a very considerable difference in individuality through its extreme effect. The effect, for instance, of mulching upon cacao is sufficiently great to make itself shown in spite of any individual variation amongst the trees of the various plots.

Possibly more instructive numerical results would be obtained from untested manurial plots by taking the yields of individual trees, plotting a frequency curve for each plot, and taking the mode rather than the mean as representing the yield. It would seem that this method of treating the Trinidad figures would be better than the present one of just striking a common average. It would show the extent of variation; a wide, flat curve demonstrating a general but small variation in almost every tree; a steep curve indicating the presence of merely a few extreme types.

The whole subject of undividuality has many philosophical aspects of much interest, and they apply to other crops as well as cacao. In orchard cultivation the matter is obviously of greater importance than in arable field work, because one has to deal in orchard experiments with a much fewer number of plants, and these are relatively permanent. Coco-nuts constitute a crop in which considerable individuality has been found to exist. A case has been observed by the writer in Barbados where a number of these trees growing apparently under exactly similar soil and climatic conditions show remarkable variation as regards productiveness. It is worth remembering that such observations are useful in the matter of seed selection. Statistical observations in connexion with the natural yield of coco-nuts are being carried on in Trinidad on similar lines to those on cacao. It has been found for instance that fourteen plots containing trees of presumably the same age show a variation of as much as 17·5 to 27·5 nuts per tree, or a difference of 750 nuts per acre.

*See *West Indian Bulletin*, Vol. XIV, No. 2.

Here the question may be fairly put forward as to whether in the Trinidad experiments with cacao and coco-nuts, the trees are planted at the same distance apart. It is true that this question has nothing to do with variation in the yield of trees itself, but it does affect a second question as to whether natural yield of the trees is a direct measure of the yield per acre. And in spite of the fact that in Trinidad the yield per 1,000 trees is the common standard, the sounder basis, and the one which we are bound to come down to sooner or later is the natural yield per acre. It would be interesting to learn the result of expressing the Trinidad average yields of pods per tree in terms of average yields per acre.

A further consideration which must not be overlooked in these experiments is the existence of a period of maximum yield. The yield of a cacao tree is not a stationary phenomenon. It is either rising or falling; appreciating or depreciating; and it is obviously necessary to be certain that all the plots we wish to compare are composed of trees which are metaphorically situated on the same point of the curve of productiveness.

From all that has been said it will be seen that the present subject is a very complex one and calls for clear thinking in the matter of planning experiments and in the interpretation of their results. In the Trinidad experiments it is essential to bear in mind that the yield of groups of trees, and not the yield per acre, is considered. On this understanding, and assuming that the trees are strictly comparable, the results of the manurial experiments following the testing of the cacao trees in their natural state are likely to be the most conclusive, as regards local application, of any that have so far been obtained.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture has been appointed by his Excellency the Governor of British Guiana (Sir Walter Egerton, K. C. M. G.) an honorary member of the Board of Agriculture and of the Permanent Exhibitions Committee of that colony.

A copy has been received of a Draft of an Ordinance to incorporate the Cacao Planters' Association of Trinidad with the object of regulating and determining the rights and liabilities of the members. It will be interesting to observe the commercial results which follow the passing of the Ordinance. It is worth noting that in this Draft, a bag of cacao is defined as weighing 165 lb.

SUGAR.

THE NORIT PROCESS OF MANUFACTURING WHITE SUGAR.

The *International Sugar Journal* contains an account of a lecture by Dr. A. Wijnberg on the Norit Process of Manufacturing White Sugar. In this process it is claimed that the colouring matter of the juice is removed by means of so-called 'decolourizing carbon', (manufactured under the name of Norit), in the same manner that this is effected by animal charcoal in the sugar refinery. This substance has already been successfully employed for bleaching purposes in various industries, but hitherto has not been used in sugar works, partly on account of its cost and partly because a method of regenerating was not known.

It is now found that the decolourizing colour of Norit can be very largely restored by boiling for fifteen minutes with a 3 per cent. solution of caustic soda.

Norit is stated to exert its decolourizing action on slightly acid sugar solutions, the colour being only slightly or not at all removed when the solution is alkaline. The author explains this action by reference to the properties of colloids of the nature of pectin which are transformed into larger molecular groupings in feebly acid solutions, but into smaller ones in alkaline. The larger molecular groups are held by the decolourizing carbon, while the smaller ones are not.

It is claimed that the decolourizing power of Norit is about twenty-five times greater than granular animal charcoal. Its decolourizing power is relatively greater in dilute sugar solutions as compared with concentrated ones, hence it is recommended to use Norit to bleach the juice rather than syrup. Norit is stated to possess the advantage of removing pectins and gums from sugar solutions, so that juice decolourized by this means is more easily filtered.

A continuation of the article is promised in which the practical results obtained in certain factories and refineries will be considered.

THE PLANTING OF CANES IN DEMERARA.

Readers of the *Louisiana Planter* will have noticed that recent issues have devoted much attention to the establishment of sugar-cane by the planting of tops. A correspondent has recently contributed some interesting observations concerning this and other matters with special regard to British Guiana.

In the West Indies for various reasons, only force of circumstances will compel a planter to re-establish his fields with material other than tops. It is noted, apparently as a comment on previous statements made in the *Louisiana Planter*, that tops from arrowing canes are never cut, much less used.

Attention is called to the undesirability of yearly replanting because of labour conditions. Moreover such a system is unnecessary as is exemplified by the statement that a crop of 25 tons per acre of Bourbon cane with juice of specific gravity of 1·75 was obtained in one instance from nineteenth ratoons. It is maintained, further that the necessity for replanting depends largely upon the variety of cane employed. D. 74 and D. 95 have never proved to be good ratooning canes in Demerara. On the other hand, D. 109 and D. 625 are two excellent seedlings from every point of view.

The History of Sugar.—Compiled from original information in the Archiefs of the Spanish Government at Seville, Spain, are the series of interesting notes appearing on this subject in the *Louisiana Planter*. The information refers particularly to the early history of sugar growing in Porto Rico. In the *Louisiana Planter* for February 20, 1915, mention is made of events that happened between 1551 and 1575. These refer principally to matters connected with the slave trade, bad shipping facilities and tariff regulations. In 1564, Porto Rico requested an explanation from the Spanish Government as to the reason why her sugars were not admitted at Seville on payment of $7\frac{1}{2}$ per cent. as were the cargoes from La Espanola. Porto Rico at this time was required to pay 15 per cent. Various other items of much interest are included but space will not permit their being dealt with in the present note.

AGRICULTURAL CREDIT IN THE PORTUGUESE COLONIES.

This statement has been prepared under the auspices of the special Portuguese Commission appointed to superintend the preparation of reports and papers for the Third International Congress of Tropical Agriculture. It describes the operations of three of the chief concerns which have been organized in Portugal to facilitate the agricultural development of the Portuguese Colonies, viz., the Banco Nacional Ultramarino, the Companhia de Mocambique, and the Companhia de Zambezia. The Banco Nacional Ultramarino was founded in May 1864, and as its name implies, its operations are concerned entirely with the overseas possessions of Portugal. It makes advances repayable by annual instalments, to promote irrigation works, the construction of roads, the formation of plantations, and other similar operations necessary to agricultural development, and in addition offers all the usual banking facilities to planters and planting companies. Its statutes defining agricultural credit and stating the conditions under which advances are made are quoted in some detail in the paper, and instances are given of the assistance it has rendered in the development of Angola, St. Thomè, Principe, and the Cape Verde Islands.

A short account of the facilities offered by the Companhia de Mocambique to settlers in its territory is also given: these include a labour bureau, a system of hiring out agricultural machinery, assistance in boundary surveys, provision of packing materials for agricultural produce, the purchase of farm stock by instalments, and assistance in the sale of produce in Europe.

Similarly the Companhia de Zambezia, with a view to developing tobacco cultivation in its territories, has instituted a scheme whereby settlers are provided with land, draught cattle, machines, drying stores, food and pay for native labourers, on condition that they grow tobacco on the land and pay interest at the rate of 7 per cent. per annum on the sum expended by the company for their benefit. The company buys all the saleable tobacco produced, at the rates current for tobacco in Nyasaland, and is prepared to take back the farm animals and machinery, less depreciation at the rate of 20 per cent. on the initial outlay, when the contract expires. (*Proceedings of the Third International Congress of Tropical Agriculture.*)

FRUIT AND FRUIT PRODUCTS.

THE CULTIVATION OF COFFEE.

A useful Bulletin of some fifty pages prepared by Mr. R. D. Anstead, M.A., (formerly Superintendent of Agriculture, Grenada,) has been published by the Department of Agriculture, Mysore State, Southern India, dealing in a simple but very comprehensive and practical manner with the cultivation of coffee in that part of the world.

The first chapter in the bulletin deals principally with the botany of the coffee plant. After describing the functions of the different parts, it is stated, in connexion with pollination and the keeping of bees, that the presence of these insects is not essential for the successful pollination of coffee, but the natural, and therefore most desirable form of pollination is achieved by the aid of flower-visiting insects, of which bees are the most important.

The first matter to be considered in the establishment of a coffee estate is the selection of seed and the preparation of nurseries. Emphasis is placed upon the importance of selecting only the best, full, perfectly shaped beans for sowing, and upon the selection of new and fertile ground for the nursery beds, in which care should be taken not to sow the seed too close together. The land selected for the establishment of the coffee trees should be a rich sandy loam containing an abundance of humus with a well-drained gravelly subsoil. If clay soils are used, they must be frequently limed. Instructions are given in the bulletin under review for the transplanting of seedlings. Holes are dug about 5 feet by 6 feet apart, and about 3 feet deep. The bottom of the holes should be broken up so that the young tap root of the nursery plant can easily penetrate the soil. When the planting season arrives with the rain, the plants are carefully lifted from the nursery beds, each with a ball of earth round its roots, and planted one in each pit, care being taken to fill the pit with the top soil, and to press the plant firmly into its place without ramming the soil too tightly.

Under favourable conditions a coffee plant will live from thirty-five to sixty years, but many trees on every estate are exhausted in ten or twelve years by unskilful treatment or the attacks of borer or leaf disease. Consequently arrangements must be made to have a constant succession of young plants coming on in the nursery to replace those which have to be taken out.

In the chapter dealing with the cultivation and preparation of the soil, it is observed that coffee is largely a surface rooting and surface feeding plant, so that the utmost care must be taken about cultivation, and fully grown coffee should not be dug deeply at all if it can possibly be avoided. After describing the methods of clearing lands for coffee, the interculture of the crop is considered and the importance of a light surface cultivation amongst established coffee is emphasized.

An interesting section in the present chapter is that dealing with the renovation of old coffee. Briefly this consists in sawing the trees off at the ground level immediately after they have borne a heavy crop. All the shade trees are felled and the land turned up in big clods. The light branches of the coffee and shade trees and all the litter are then spread over the field and the whole given a quick burn. The soil is again forked and an application of about a ton per acre of good slaked lime is then worked into the top soil. Erythrina and new shade is then planted. The coffee stumps sucker, and each is allowed to grow the two most healthy shoots thrown out. After two years the suckers are reduced to one, and in three or four years a complete new root system has been formed and a new healthy tree produced. The results of the above treatment have been most successful and have repaid the cost, which is considerable.

After calling attention to the necessity for drainage, consideration is given to the question of shade. It is stated that in South India it is necessary to grow coffee under shade. Probably the best all-round shade tree in Southern India is the silver oak (*Grevillea robusta*), which possesses nearly all the good points required for a shade tree amongst coffee; namely, growth not too large, big spread of branches, retention of leaves in the hot weather, root system not too near the surface of the soil, and lastly, immunity from the attacks of insect or fungoid pests which attack coffee. In the course of the developments of the estate the shade trees have to be regulated, and detailed instructions are given as regards carrying this into effect.

The next two subjects dealt with are pruning and weeding. If the coffee plant is left alone, it forms a tall bush with a number of long, upright primary branches on which the berries are chiefly borne. In this form it is easily broken by the wind, and the crop is not easy to gather without breaking the branches. For this reason the young trees are usually topped by cutting off the leading shoot with a sharp knife when they are about 5 feet high. A common system of pruning is to take off the alternate secondary branches to allow for the extension of the tertiary branches on which the berries are chiefly borne. Sometimes this is accompanied by the development of a mass of suckers; these must be removed, and the process is known as 'handling' the trees. The worst weed on the South Indian coffee estate is grass. A constant war should be waged against grass and it should be remembered that the first principle in destroying this or any other weed is to attack it before it has time to ripen seeds. Whereas vegetation of this kind growing in the soil is exceedingly harmful, a mulch of leaves derived from weeds or shade trees is very beneficial. The reasons for the good action of mulches is now well known to planters, and it may be pointed out that this method of soil improvement and manuring is becoming widely recognized all over the world in regard to nearly every orchard cultivation.

One of the last chapters, and by far the longest, is that dealing with the manuring of coffee. From the information already presented in this abstract it will have been realized that the previous sections dealing with cultivation contain much sound, practical knowledge bearing directly upon the successful production of the crop in question. The chapter on manuring, though interesting and enlightening cannot be commented on in the same way. It explains the general principles of plant nutrition, the general composition of manurial substances, and gives some attention to the valuation of manures, whilst a note on the mixing of fertilizers is appended. But a search through this information for references to coffee is rather disappointing; it is noticed, however, that the general practice in applying manures in Southern India is based upon their application in connexion with the occurrence of the monsoon. It seems that potash should be applied before the monsoon, and phosphoric acid half before and half after the monsoon, the after monsoon application to be in an available form such as superphosphate. The nitrogen should be applied after the monsoon in an available form. Attention is called to the cheap and valuable nature of waste materials on the coffee estate for manurial purposes. It is urged that coffee is benefited by the cultivation of suitable leguminous cover crops provided the soil is first got free from weeds.

The last chapter deals with the handling of the crop. This subject, which involves such important points as picking, pulping, fermentation and packing, is most disappointingly short. It would be of interest to have found a full description of the method of fermentation adopted in Southern India, and the methods and machinery employed in the drying and handling of the crop. Apart from this criticism and the suggestion that more space might have been devoted to pests and diseases, we may confidently state that the bulletin under review is likely to prove of great service to those who are in possession of estates, and to agriculturists who intend embarking upon such an enterprise under similar conditions to those obtaining in Southern India.

COCO-NUT AND PALM KERNEL CAKES.

The value of these two by products of tropical crops as foodstuffs for domestic animals, particularly cattle, is dealt with very fully in two recent publications—the *Bulletin of the Imperial Institute*, Vol. III, No. 4, and the *Journal of the Board of Agriculture* (England), Vol. XXI, No. 11.

The former publication treats the subject chiefly from the economic aspect as regards the war, advocating the desirability of British merchants utilizing the enormous supplies of copra and palm kernel which are now available owing to the cessation of the trade in them with Germany. The result of doing so would be the production in Great Britain of large quantities of residual cake or meal.

Both journals endeavour to demonstrate the value of this material as foodstuff for cattle. The following figures have been extracted to show the comparative food value of the two classes of cake under consideration:—

CRUDE NUTRIENTS.

	Coco-nut cake.	Palm-kernel cake.
Moisture	8·5	12·0
Crude protein	24·5	16·75
Fat	8·3	7·07
Carbohydrates	37·8	46·83
Crude fibre	12·8	13·55
Ash	6·1	3·8

Food units: coco-nut cake, 122; palm-kernel cake, 106. Decorticated cotton-seed meal contains 157 food units and undecorticated 107 food units. The value at Liverpool (January 1915) of coco-nut cake was approximately £6 15*s.* per ton, while that of palm-kernel cake was just under £6 10*s.*

Summarizing the value of the cakes in practical feeding, the *Journal of the Board of Agriculture* states:—

1. Palm nut kernel and coco-nut cakes or meals are valuable foodstuffs, particularly for milch cows, when they can be obtained of good quality at a price which compares favourably with the prices of such feeding stuffs as linseed cake and cotton cake. They are also useful for replacing oats for horses, but are probably of less value for fattening bullocks, sheep and pigs.

2. Farmers should buy under guarantee as to analysis, paying special attention to the percentage of oil, fibre, albuminoids and carbohydrates. They should insist on fresh, well-made cake, and should not buy more than a three month's supply.

The above is, of course, advice for the British farmer, but it will prove of interest to planters and show that every endeavour is being made in England to find a market for tropical produce which has been affected adversely through the European war.

Fruiting Capacity of the Papaw.—The question of the advantage derived from thinning out the ring of fruits on the papaw tree is discussed in an Indian article reproduced in the *Tropical Agriculturist* for January 1915. An experiment was conducted at Poona with the fruit of twenty plants, ten of which were thinned and ten unthinned. The number of fruits obtained from the thinned was ten, whilst the unthinned gave twenty-four. Although the increase in weight of the individual fruit in the case of the thinned plants was very considerable, and although there was an accompanying rise in the price, the results showed that the increase of weight and value was not sufficient to compensate for the loss of fruits. This conclusion refers only to the particular experiment just described. The article goes on to say that with a small number of say six good fruits per plant the experiment may pay ultimately when carried out on a large scale as indicated in the *Annual Report of the Government Horticultural Gardens, Lucknow*, for 1912, where it is stated that an acre of land carrying 1,000 plants each producing six to ten fruits after thinning may give considerable profit to the grower. The difficulty is to hit on exactly the right amount of thinning to get the greatest weight compatible with the greatest number of fruits. This can only be obtained by practice, and in the meantime it is recommended to remove only such fruits as are obviously going to be badly crushed.

The Colour of Cowpeas.—Colouration of the seed-coat of cowpeas and beans is a matter of some interest and of no little importance from the commercial standpoint. We know that a dark seed-coat reduces the market value of bean or pea-meal because of the unfavourable appearance it produces; and we are aware that in the case of one species of bean, dark colouration is indicative of the presence of poison. The colour of cowpeas as investigated by Albert Mann of the United States Department of Agriculture (see the *Journal of Agricultural Research*, April 15, 1914) deals more especially with the botanical aspect of the subject. He shows that the testa is composed on the outside of a cuticle, and below this a palisade layer of very elongated cells. Underneath this is the so-called middle or hour-glass layer (so-called from the resemblance of each cell to the shape of an 'hour-glass'); underneath this finally, is the so-called basal-colour layer. The greatly diversified colour of the different varieties of cowpeas may be reduced to two factors: (1) an extremely uniform basal colour, pale yellow to deep copper-red, deposited in the basal-coloured layer; (2) a superimposition upon this basal colour of variously arranged pigment areas in the palisade layer. It was found that in most parti-coloured cowpeas of strongly contrasted tints, the strongly coloured areas have perfectly regular, symmetrical palisade cells, while the lighter areas are more or less strongly contorted in form and irregular in the cell cavity. In other words, there is traceable in all of these cowpeas a decided correlation between the morphology of the palisade cells and the suppression of the pigment in these cells.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date March 31, 1915, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 250 bales of West Indian Sea Island cotton have been sold, chiefly Montserrat 15*d.* to 15¾*d.*, with a few St. Vincent 15*d.* to 18*d.*, St. Kitts at 15*d.* and Stains at 5*d.* to 7*d.*

The market remains quite firm, but with only occasional enquiries. Seeing that American Sea Island has advanced in price, we see no reason why these prices should not be maintained although, owing to the dislocation of the fine trade on account of the war, progress will probably be slow.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended March 27, is as follows:—

The sales consisted of several Planters' crop lots for export to England, at prices ranging from 25½c. to 27c.; otherwise the market was quiet. There is some further demand for crop lots, but at prices 1c. to 2c. below the views of planters.

The limited unsold stock of odd bags classing Fine to Fully Fine is firmly held at quotations.

We quote, viz:—

Extra Fine 23c. to 24c. = 14*d.* to 14½*d.*, c.i.f. & 5 per cent.
Fine to Fully Fine 22c. = 13½*d.*, " " " "
Fine, off in colour 18c. to 20c. = 11½*d.* to 12*d.* c.i.f.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, and Manchester, up to March 27, 1915, were 103 and 1,516 bales, respectively.

British Cotton Growing Association.—The 133rd Meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on Tuesday, March 2. The President, The Right Hon. the Earl of Derby, K. G., occupied the Chair.

WEST AFRICA. Owing to the inadequate supply of steamers from Liverpool there is a large accumulation of produce in the Government Railway Stores at Iddo, and as a consequence some difficulty is being experienced in shipping the Association's cotton and seed, and it is hoped that arrangements will soon be made for a more adequate steamship service between Liverpool and West Africa. The reports from West Africa state that the crop is a late one this year, owing to the drought during the last planting season, but it is too soon yet to form any reliable opinion as to the size of the crop.

The purchases of cotton in Lagos to the end of February amounted to 165 bales, as compared with 2,480 bales for the same period of last year. In Northern Nigeria, the purchase to the end of January amounted to 23 bales, as compared with 65 bales last year.

UGANDA. With regard to the proposed arrangements for financing the 1915 Uganda cotton crop, a letter has been received from the Colonial Office expressing warm appreciation of the public spirit which the Association have shown in their desire to take all possible steps to safeguard the industry, and regretting that the great pains which were bestowed on the preparation of the scheme should have been wasted. Arrangements have now been made for the buying of the crop in some districts, which will ensure the natives obtaining a fair price for their crop, but in some of the more remote districts no arrangements have yet been made for buying the cotton, and for the future welfare of the industry it is hoped that steps will be taken before long to ensure the natives a ready market for their cotton.

COTTON EXPERIMENTS IN ST. CROIX.

Through the courtesy of Dr. Longfield Smith, Director of Agriculture, we have received an advanced copy of that portion of his Annual Report for 1913-14, which deals with cotton experiments.

Details are given of the results obtained from planting the seed of fifty selected varieties, compared with last year's results from the parent plants. The mean result given by the progeny is very closely similar to that from the parents. Twenty-one of these strains have been kept for trial on a larger scale.

The plots of Sakellarides and of the Upland variety Southern Cross have given no better yields than can be obtained from Sea Island cotton, hence their cultivation cannot be recommended. Small plots of Caravonica have yielded at the rate of over 1,000 lb. seed-cotton per acre.

A very interesting section of the report deals with the results of hybrids between Sea Island and the St. Croix 'Native' cotton. Ratoons from the previous season's hybrids were kept, and bore exceedingly well. They were destroyed, because of harbouring cotton stainers, while still full of bolls, and up to then had yielded from 700 to 900 lb. of lint per acre.

Experiments were made with a view to the production of first-generation hybrids on a larger scale, and it was found that by pollinating the flowers of the 'native' early in the morning, about 70 per cent. of hybrids were obtained without bagging or emasculation. Since the young plants are easily distinguishable, it is possible by planting several seeds to the hole and singling two or three weeks later, to obtain a good stand of the hybrids. The lint of these first-generation hybrids is worth about 15*d.* with Sea Island at 17*d.* Dr. Smith finds that such hybrids are immune to leaf-blister mite. This has not been the case in similar experiments seen by the writer, where a proportion at least of the plants have been susceptible.

Experiments have also been carried on with hybrids between Sea Island and Sakellarides, some of which are now in the third generation. This cross differs from the previous one in that the generations subsequent to the first do not split up into a complex medley of inferior types, but remain fairly uniform. Owing to bad germination only a few plants were obtained. They bore much more heavily than Sea Island, and the experiment is being continued.

The question as to the adoption of the policy of growing first year hybrids between Sea Island and 'native' is one of interest and importance to all the cotton-growing islands. The large yield and greater resistance to pests may well induce planters whose experience has been unfortunate in these matters to face the extra trouble which has to be taken in securing seed. As regards the individual planter, the results may be excellent, but unless his neighbours are also prepared to work on the same lines the effects to them may be disastrous. It will be very difficult to maintain for long anything like a pure strain of Sea Island plants within a wide radius of what would be, from

that point of view, a plantation of rogues. For a grower whose land is isolated, or for an area, preferably an island, covered by properties whose owners are agreed to adopt it, the policy may stand or fall by the degree of its success; but where it is practised by only one among a number, the rest of whom desire to continue to grow Sea Island, a position will arise similar to that brought about by the keeping of diseased plants, which in several islands has been the subject of special legislation.

W. N.

EXPORTS OF SEA ISLAND COTTON.

RETURN OF SEA ISLAND COTTON EXPORTED FROM THE VARIOUS WEST INDIAN COLONIES FOR THE QUARTER ENDED DECEMBER 31, 1914.

Colony.	Bales.	Weight.	Estimated value.
	No.	lb.	£
Barbados	6	2,950	197
St. Vincent	—	—	—
Montserrat	40	16,238	827
Antigua	31	7,750	388
St. Kitts	181	90,500	5,656
Nevis	443	181,967	11,373
Anguilla	—	—	—
Grenada	—	—	—
Virgin Islands	—	—	—
Jamaica	3	750	38
	704	300,155	18,479

Land Development in Cuba.—According to an article in *Modern Cuba* for March 1915, a Commission has recently examined the south-western lands of that island and found them capable of profitable development if better transportation and good drainage can be provided. It is stated that all kinds of crops may be grown on these lands, and the writer emphasizes a diversification of crops and rather tends to discourage the cultivation of tobacco. Perhaps because the writer is a horticulturist he strongly advocates the growing of vegetables. It is especially interesting that he lays great stress upon the profitable nature of bean cultivation. In this connexion attention is called to the necessity for purchasing threshing machines and other labour-saving machinery. It is urged that no very great area under this crop is required to render such investments of capital economical. It is said that the reason why planters tend to grow tobacco is because they can receive credit on this crop. Naturally the money lenders are not anxious for land owners to grow beans and vegetable green crops since they would then lose the greater part of their business.

The Canadian Trade Commissioner for the West Indies has furnished this Office with a memorandum from the Department of Customs, Ottawa, showing the most recent changes in the tariff, some items of which apply to West Indian products. It appears that the following articles connected with West Indian trade are exempted from the provisions of the new war tax: bananas, cotton-seed cake and cotton seed meal, and coffee.

VARIETIES OF CASSAVA.

The following notes on local varieties of cassava are taken from the *Journal of the Jamaica Agricultural Society* for February 1915:—

(1) *Bobby Hanson or Gordon* is an early variety and matures in nine months. It will give good results in all soils except soils remaining always wet. Grows equally well from sea-level to 2,000 feet elevation.

(2) *Pum-pum or Bunch of Keys* is another early variety and matures between nine and twelve months. The holes for this variety may not be more than 1 foot in length, but may be 2 feet wide. The tubers are generally short and stout. Hilly or gravelly land suit it better than any other soil. Planted at too great an elevation may result in 'tree' and not tuber development.

(3) *Grey Hound* is a variety of considerable growth, many and large tubers. It does not yield as much flour as the two varieties mentioned before. It matures in ten or twelve months. Red soil is not the ideal one for it, but it suits best a conglomerate such as brown earth and brown gravel mixed.

(4) *Red Jacket* is a variety of many tubers but not necessarily large. It matures in twelve months. It bears best in gravelly land of brownish appearance.

(5 & 6) *Brown Stick and Smalling* are varieties much alike in many ways. They thrive in the same kind of soil; much humus should be in the soil where these are grown and they give very good account of themselves from a little above sea-level to 3,000 above. The flour and starch yield from these varieties is considered the best. They are later to mature than the other varieties. In dry soils they mature between twelve and fourteen months. In damp soils they mature between fourteen and eighteen months. The Smalling variety is chiefly planted. Its tubers are the largest, and while the first tubers never fail to continue their development after they are a year old, other tubers go forth from the first. They seldom lose in weight, however long they are kept before they are lifted.

HOLES, CUTTING AND PLANTING. Except in the case of the Pum-pum, the holes should be not less than 2 feet (length) by 1 foot (width). The depth should be about 9 inches. These remarks apply to the stiffer soils. In fine light soils a foot square is sufficient. All cuttings should be close to a node or eye, and need not be more than 6 inches in length, the plants being shorter where the nodes are not far apart. At this time when there may be much rain about $\frac{1}{2}$-inch of plant may be left uncovered and these plants should be put in slanting, the tuber-producing end not being more than 4 inches deep. It is hoped the people will not place more than one cutting or plant in each hole. There is no necessity for more.

Attention has been called in the *Veterinary Record* (February 13 and 20, 1915) to the value of iodine in sterilization. The preparation especially noted is iodobenzine, which is made by pouring some tincture of iodine into a certain quantity of benzine. Gratifying results are claimed for its use, first for sterilizing the hands, it being sufficient to rub in a small quantity; secondly, as a ready method of preparing dressings by soaking them in the solution which is then allowed to evaporate; and thirdly, for sterilizing wounds by application of tambons medicated in this manner.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

Vol. XIV. SATURDAY, APRIL 24, 1915. No. 339.

NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue, dealing with individuality in cacao trees, reviews and criticises the work in this connexion which is being carried on in Trinidad.

A useful article describing the cultivation of coffee as practised in Southern India will be found on page 132.

Cotton Notes, which appear on pages 134 and 135, contain a review of experiments in St. Croix, a list of the exports of Sea Island Cotton from the West Indies, together with market and other reports.

Insect Notes and Fungus Notes, which will be found on pages 138 and 142, deal with the sweet potato weevil and a bacterial disease of Lachnosterna grubs, respectively.

Notes on cattle testing, indigo, and leguminous food crops, will be found on pages 136 and 137.

Publications of the Imperial Department of Agriculture.

An interim report on the Agricultural Department of Grenada for 1913-14 has just been issued. In the exceptional circumstances arising from the recent staff changes in the Agricultural Department of that colony the general administration report has been compiled at the Head Office of the Imperial Department with a view to preserving continuity. The publication contains the customary report on Land Settlement and Forest Reserves.

Recently issued also, is the revised circular dealing with the Courses of Reading and Examinations in Practical Agriculture. Apart from its immediate educational function, planters and others who are desirous of reading literature pertaining to the various tropical crops will find the general list of books recommended, of much interest and assistance to them.

The Report on the Sugar-cane Experiments in the Leeward Islands, 1913-14, has nearly all been passed to press and will be issued shortly. A valuable guide to the Dominica Botanic Gardens, with full index of plant names, will appear about the same time.

Leguminous Crops as Stock Food.

Recognizing the need and importance of introducing leguminous crops into the planting systems of Hawaii, the Experiment Station of that territory published in 1911 a Bulletin (No. 23) based on local trials that had been made with cowpeas, Jack beans, pigeon peas, velvet beans, and so on. The matter has received similar attention in many other parts of the Tropics, but the publication referred to deals with the subject in a particularly useful manner, and gives several items of information that may with advantage be recorded in the present note.

The most interesting feature of the Bulletin is, perhaps, the attention given to the feeding value of the different crops both as fodder and as grain. The palatability of cowpeas is referred to, and it is remarked that although the velvet bean is less attractive to stock it nevertheless constitutes a useful foodstuff, particularly the selected strains, and cattle can be taught to like it by its gradual introduction into a ration containing corn and sorghum. The green fodder of the Jack bean (*Canavalia ensiformis*) is stated to be relished by dairy cows, and especially by swine. The bean meal from this crop is said not to be very digestible and palatable for cattle but this may be due, it is suggested, to a too limited experience in its use.

The ease with which the pigeon pea can be harvested and its value as a soil improver and as a wind-break are referred to. A number of growers, it is said, have fed the plant tops bearing seeds, to horses and cows with good results: likewise the seeds have been found excellent food for poultry.

Altogether the Bulletin, which is illustrated with a large number of good photographs, is a very admirable publication, and constitutes a useful reference at the present time when increased attention is being given to leguminous crops in the West Indies.

Fermentation of Indigo.

In view of the present scarcity of the synthetic product and consequent high prices, attention was given in a recent number of the *Agricultural News* (Vol. XIII, No. 331) to the cultivation and preparation of natural indigo. In connexion with this subject, an interesting paper appears in the *Journal of the Chemical Society* (June 1904) entitled The Fermentation of the Indigo Plant, by Cyril Bergtheil. In the summary to this paper it is stated that there are several kinds of bacteria capable of producing indigo fermentation, some of which are always present in an infusion of the plant; but the action is in the main dependent on a specific enzyme or ferment occurring in the plant cells. This enzyme acts on a glucoside also occurring in the plant cells, producing a substance capable of giving indigotin by oxidation with air, and a reducing sugar. Owing to its peculiar properties and lack of knowledge concerning the glucoside, this enzyme has not yet been named. The action appears to take a similar course and to be characterized by similar variations with temperature and changes in the medium in which it takes place like that of other enzymes. No evidence was obtained of the existence of an oxidase in the indigo plant.

Nature Study in the Elementary Schools of Trinidad.

Council Paper No. 201 of 1914, comprising the Annual Report of the Inspector of Schools on Elementary Education in Trinidad for the year 1913-14, contains satisfactory information regarding the teaching of agriculture and the study of nature in the Colony's schools. It is stated that 230 schools received awards at their annual examinations, as against 227 in the previous year. Of these, eighty-seven were considered Very Good, ninety-three Good, forty-nine Fair, and one Unsatisfactory. A large number of visits was paid during the year by the Agricultural Instructors, and the senior officer delivered weekly lectures in the Training School. It is stated that the students continued to take full advantage of the instruction given, and are making satisfactory progress.

Considerable headway has been gained in regard to nature study, especially in the larger schools. In some of the schools the teachers take the children out for nature study excursions. It is urged that this should be universal, but to be of value must be systematic, and notes should be taken of what is seen. It is observed that in some of the schools, nature study appears to consist rather in committing to memory dry facts and names than in gaining an intelligent and practical acquaintance with principles and operations. Very creditable museums are to be found in some schools, but except for rare specimens, the writer considers the collections should be from time to time renewed. By this is meant that each school generation should do its own collecting.

Copies of the *Agicultural News*, issued by the Imperial Department of Agriculture for the West Indies, as well as the Proceedings of the Local Agricultural Society have been, as hitherto, distributed among the principal schools of the Colony. The report on School Shows makes it evident that considerable activity has been displayed in this matter, and no doubt the Trinidad Horticultural Society will give the schools increased assistance in this respect, thereby rendering further useful services to the Colony.

Cattle Testing for the Tropics.

The regulation of many colonies and foreign countries relating to the importation of live stock has at last made it necessary for the English Board of Agriculture and Fisheries to establish a cattle-testing station. This institution, which is situated in Surrey has accommodation for 100 head of cattle, and the work carried out at the station at present is confined to the testing of animals for tuberculosis, and to the immunization of cattle against Red Water disease. The action taken in regard to this latter disease is of significance from a tropical aspect. It indicates that hitherto stock breeders in countries like British East Africa and Jamaica have been loath to import susceptible pedigree animals. It is likely that the immunization of English pedigree animals against Red Water will result in an increase in the overseas trade in cattle, especially as regards the Tropics. In time the Board expects to be able to deal with other contagious diseases in the same way. The functions and the accommodation of the Station are dealt with in Leaflet No. 290, recently issued by the Board.

British Press and West Indian Agriculture.

The agency press cuttings that have come to hand by recent mails contain an exceptionally large amount of matter relating to agricultural activity in the West Indies. The *Financier and Bullionist* publishes lengthy reviews on the trade of St. Vincent and St. Lucia, based on the Colonial Reports for 1913-14. The same subject is dealt with as well by the *Financial Times*. Special reference is made to the work of the Agricultural Departments, and a full account of the efforts to establish minor industries in St. Vincent is given, as well as a comprehensive statement concerning the St. Lucia Government Lime Juice Factory. It is satisfactory to see that the English press realizes fully the dependence of island prosperity on increased agricultural activity. The *Morning Post* synchronically discusses labour matters, with special reference to East Indian emigration. Since the outbreak of war East Indian emigration has been, of necessity, temporarily suspended. Recruiting for Fiji has, however, already been resumed, and the Colonial Office has stated that it is expected that it may shortly be possible to recruit again for the West Indies also. Many references appear in various newspapers to the gifts of sugar, and especially those of citrus fruits, of which the latter are being distributed on behalf of the Army Council by the West India Committee amongst the hospitals in London and elsewhere.

INSECT NOTES.

THE SWEET POTATO WEEVIL.

(CYLAS FORMICARIUS, FAB.)

In accounts of the scarabee or Jacobs of the sweet potato (*Cryptorhynchus batatae*) which have appeared in the publications of the Imperial Department of Agriculture, mention has been made of the sweet potato weevil (*Cylas formicarius*), and figures have been given showing the difference in appearance between these two insects. They are both weevils, in that they are beetles with the front of the head prolonged to form a beak or proboscis, at the extremity of which the biting mouth parts are situated. Since the West Indian insect, *Cryptorhynchus batatae*, is already well known and designated by its common names, scarabee and Jacobs, it will be sufficient to retain the name 'sweet potato weevil' as applying to the other species, *Cylas formicarius*, which does not as yet occur in the Lesser Antilles, so far as the records of this Department show.

DISTRIBUTION. The sweet potato weevil is distributed throughout the tropical and subtropical parts of the world, and it is probably capable of living wherever sweet potatoes are grown on a large scale. This insect was originally described from the East Indies in the 18th century, and as a pest of sweet potatoes it was recorded from Ceylon in 1856. It is likely that the species is a native of Africa since the genus Cylas is represented by a large number of species in that Continent, while very few occur elsewhere.

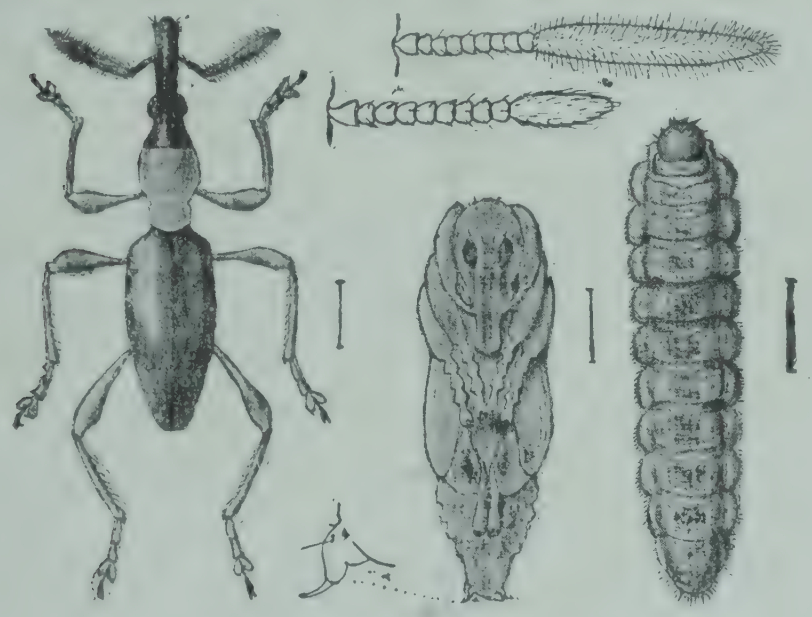


FIG. 5. SWEET POTATO WEEVIL.
Adult, Pupa and Larva. (*From U.S. Dept. Agric.*)

At the present time *Cylas formicarius* occurs as a sweet potato pest in India and the Far East, in Africa, the United States, Jamaica, Cuba, British Guiana, and the Bahamas. It is stated to have been recorded from Barbados, but it does not appear to be known in that island at the present time, nor indeed has it been known there for many years past. This insect has been known and recorded as existing in Cuba, Jamaica, British Guiana, and the United States, but the present record of its occurrence in the Bahamas is quite new. This record is based on the identification of specimens received from the Secretary of the Board of Agriculture, Nassau, Bahamas, by the Imperial Commissioner of Agriculture for the West Indies.

The sweet potato weevil would seem to be fully as destructive as the scarabee, and the injuries caused by it are very much like those caused by the scarabee. Instances are recorded in which entire crops of sweet potatoes have been destroyed by the sweet potato weevil.

METHOD OF ATTACK. The sweet potato weevil deposits its eggs in the thickest vines near their base, and in the roots of the potato where these are exposed at the surface of the soil. Once an attack has begun, that is, when the first infestation has taken place in a potato field, the development of the weevil and its increase in numbers is merely a matter of time. The life-cycle occupies about thirty days: the adults developing from the first infestation continue and spread the attack throughout the field and carry it to the roots: each succeeding generation greatly increases the amount of injury, and it will be seen that prevention of the beginning of the attack for as long as possible after planting, and harvesting as soon as the potatoes are ready, will do a great deal in reducing the amount of injury.

METHOD OF CONTROL. The sweet potato weevil attacks potatoes in the same manner, and the damage caused by it is of the same kind and extent as in the case of the scarabee, so that the remedial measures to be adopted would be the same in both cases.

In the first place potatoes ought not to be planted on the same land for two successive crops, and next, all planting material should be quite free from infestation. This can be assured by planting with slips grown in a nursery, from uninfested small roots or tubers.

The nursery should be established where there is the least likelihood of the weevil being present, and should not be maintained long enough for it to become infested. Slips for planting should never be taken from a field in which either the sweet potato weevil or the scarabee is known to be present. If material for planting is scarce and it becomes necessary to use slips from a field which is suspected of being infested, none but the smallest tips of the vines should be taken for the purpose, for the first attacks always occur in the older more woody portions of the stem.

THE INSECT. The sweet potato weevil is a slender insect about $\frac{1}{4}$-inch in length. The head and wing covers are a bright, steely blue in colour, the thorax and legs being reddish. The head is prolonged into a slender, forwardly-directed snout: the eyes are situated at the base of the snout, and the antennae are attached about midway its length. This is well shown in the accompanying illustration, fig. 5, which shows the adult, pupa and larva all enlarged to about seven times their natural size. The larvae and pupae are whitish, the head of the former being yellowish brown, and the eyes of the pupa reddish.

The scarabee is shorter and stouter, being about $\frac{1}{7}$ or $\frac{1}{6}$-inch in length. Its snout is slender and turned under the head in such a way as to render it quite inconspicuous.

The attacks of these two insects produce the same appearance in the potato. Planters and others who experience any trouble from insects attacking sweet potatoes would do well to put an infested potato into a tight wooden box covered securely with muslin or fine wire gauze, and rear a few insects in order to determine which species is causing the trouble.

The sweet potato weevil is a serious pest, and every precaution should be taken to prevent its introduction into any colony where it does not exist at present.

H.A.B.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. It is stated by the Superintendent of Agriculture (Mr. J. C. Moore) that the large number of lime plants and coco-nut plants established in the nurseries are making good progress. As regards cacao, the general condition of the orchards is stated to have been good, high winds not having made themselves felt until later than usual this year. Pickings showed a considerable reduction during the month, but there was a fair prospect of the remainder of the crop being obtained satisfactorily. The visit of the Entomologist and Mycologist of the Imperial Department of Agriculture involved travelling by the Superintendent, and resulted in useful observations being obtained. Collection of information concerning thrips is being conducted. In connexion with land settlements, three meetings of proprietors were held by the Agricultural Instructor. Concerning reading courses, arrangements are being made with the help of the Imperial Department, to establish a library for the use of the Agricultural Cadets.

DOMINICA. A communication from the Agricultural Superintendent (Mr. Joseph Jones) for March contains notes of interest regarding the various lines of departmental activity. In the nurseries usual routine work was being carried on; in the lime experiment stations work principally consisted in sanitation operations, for example, weeding, tarring and spraying. In the cacao experiment station, the recording of yields and sweating and drying of cacao were the principal occupation. Observations relating to staple crops show that the demand for green limes in New York was depressed, nor was raw lime juice in great demand. Cable quotations showed that concentrated juice remained at £21 per pipe, but it was reported that forward contracts had been made at a much higher price. As regards special efforts on the part of the officers, a considerable portion of the month was spent in travelling, and the estates visited formed the subject of a separate report to the Commissioner of Agriculture. The appointment of a Chemist has been authorized by the Government, and the office takes effect from April 1915. Mr. G. A. Jones, Assistant Curator, has been appointed to the post. During the month the weather was exceptionally dry, only 0·84 inches having been recorded at the Botanic Gardens.

MONTSERRAT. Mr. Robson's report for March contains important references to the cultivation of vegetables in this island. The question of forming an Onion Growers' Association is being considered, but an experiment has tended to show that the lands at Harris in the middle of the island are not well suited for this crop. A trial shipment of 37 crates of onions was made to Canada on March 23. The date for the commencement of cotton planting was changed to March 20, but as no suitable rains fell, the planting had not yet been started. Attention was given to the distillation of bay leaves during the month, and Mr. Robson paid a visit to Antigua in connexion with the Onion Growers' Association of that island.

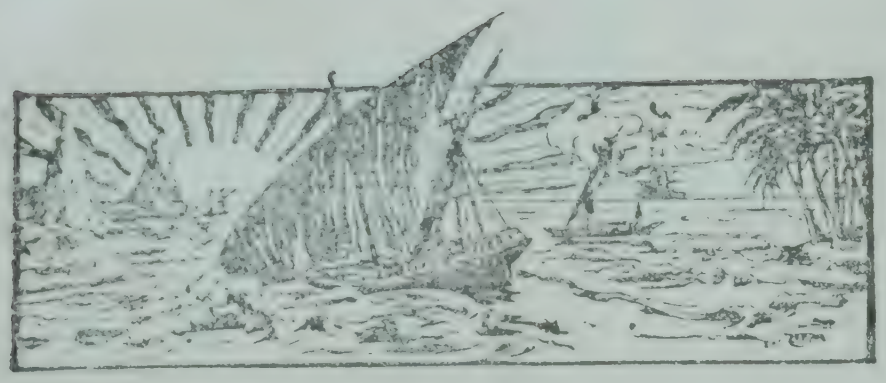
ANTIGUA. According to a communication from the Agricultural Superintendent (Mr. T. Jackson), most of the routine work in the Experiment Station concerned the experimental plots of sugar-cane. On the estates, in spite of the dry weather experienced during the month, the young cane crop was looking remarkably green and healthy. The fields of Indian corn also looked promising, on the whole. The onion crop has been rapidly harvested. During the month 1,442 crates of onions were shipped from the Association's premises. At the time of writing the report (April 3) there were 700 more ready to go forward. Special work included the erection of new machinery at the Government granary, and the shipment of vegetables to Canada. As in the other islands, the weather during the month was very hot and dry. Rainfall only 0·74 inches (Botanic Gardens).

ST. KITTS. During the month of March work in the experiment stations included principally the reaping of Bengal beans, and onions, and the sale of 1,050 lb. of selected cotton seed. Ratoon canes were cut and 600 cane plants distributed. At the time of writing, 3,500 tons of sugar had been made at the Central Factory. The tonnage of cane per acre this season has been very disappointing, and the output of the Factory will be below the amount estimated. Similar disappointment has been felt by the muscovado makers. The young cane crop is healthy but is naturally feeling the want of rain. The precipitation for the month at Basseterre was only 0·48 inch. Appended to the above report (by Mr. F. R. Shepherd), is a summary of the work conducted in the Government laboratory by Mr. Waterland, Assistant Chemist; this included soil and lime analyses, and determinations in connexion with syrup, final molasses and cane juice.

Manuring Tea.—The editorial in the *Tropical Agriculturist* for January 1915, deals with the results of the experiments with green manures for tea in progress in Ceylon at Peradeniya. The object of the experiments is to determine whether green dressings can be used as a source of soil nitrogen in place of artificial manures on which at the present time there is a local expenditure of £300,000 per annum. Fifteen plots have been under experiment since 1906. The green dressings used are Crotolaria, Erythrina and Albizzia. At the end of the first year it was found that there was an average increase due to Erythrina of 33 per cent., and to Crotolaria of 11 per cent. In the seventh year after treatment, the Erythrina gave 520 lb. more tea per acre, or 74 per cent. more than the control for the same year. The other green manure plots, though not so good as Erythrina, showed substantial increases over the control of the seventh year. The trials have, it will be seen, demonstrated that leguminous plants can be cultivated among tea with most beneficial results.

In the *Journal of the Royal Society of Arts* for February 12, 1915, a statement is made to the effect that coco-nut water has been employed in Ceylon as a rubber coagulant. It is understood that by fermentation the juice is changed into acetic acid, which is the active coagulant. It is said that acetic acid produced in this way gives better results than the ordinary commercial product, especially as far as colour of the rubber goes. Experiments are being carried on to determine how long the liquid will keep and whether it is practicable to transport it from the coco-nut plantation to the rubber estate.

In spite of hopes to the contrary, the production of cigars in the Jaffna district of Ceylon has not turned out to be a commercial success. The cigars are quite unsuitable for the British market, and probably also for any European market. According to the *Tropical Agriculturist* of January 1915, the heavy duties on cigars in the United Kingdom make it practically impossible to sell any kind of cigar there at less than $1\frac{1}{2}d.$ to $2d.$ each. At this price the consumer has a great variety of cigars made from carefully blended tobaccos of fair quality to choose from.



GLEANINGS.

Messrs. Ide & Christie's Monthly Circular dated March 15, 1915, gives the current prices for the principal fibres, and is a useful publication in this respect. Sisal hemp prices (Mexican) were up to 30*s.* to 31*s.* Ceylon coir (coco-nut fibre) showed an improvement of 30*s.* to 63*s.* per ton.

Reference to an interesting vegetable fat is made in the *Experiment Station Record*, Vol. XXXII, No. 3. A physical examination of this substance which was said to originate in the East Indies, showed it to correspond to Malabar tallow or Chinese tallow, from *Stillpinia sebifera* and various varieties of the Jatrophas.

A notice appearing in *Tropical Life* for February 1915, states that the third volume of the *Flora of Jamaica* by Fawcett and Rendall has made its appearance. It deals with the dicotyledons and contains nearly 300 pages, 113 illustrations in the text, and five plates. Copies, price 15*s.*, can be obtained from the Natural History Section of the British Museum, London, S.W.

The individual variation in the alkaloidal content of Belladonna plant forms the subject of a paper in the *Journal of Argicultural Research*, Vol. I, No. 2. There appears to be nothing to indicate any correlation between the physical appearance of the plant and the alkaloidal contents of its leaves. Variations in the percentage of alkaloids in the leaves of different plants is exceedingly large. This appears to be an hereditary characteristic.

In accordance with the Act, the report of a Public Audit into the financial position of the Agricultural Credit Societies, St. Vincent, has recently been made and published in the St. Vincent *Government Gazette* for February 4, 1915. The statement of assets and liabilities of six different societies are given. The principal liability in each consists in the loans from the Government, which up to January 1915 ranged between £65 and £120 for each society.

It is stated in the *Gardeners' Chronicle* for February 13, 1915, that rhubarb has been successfully cultivated in the tropical regions of Queensland. There the plant is treated as an annual. The seed is sown in boxes in February (the wet season) or in March in the open ground. When sufficiently large the seedlings are transplanted. Four months after sowing, the stalks are ready to be pulled. After November, the plants are killed by the intense heat.

Immediately after the roots of the sweet potato are harvested there occurs a rapid transformation of starch into cane sugar and reducing sugars. During its growth the sweet potato root is characterized by a very low sugar content, most of the reserved material being starch. If sweet potatoes are kept in cold storage there is a rapid increase in cane sugar. A temperature of about 15°C. is sufficient to keep the moisture content constant. (*Journal of Argicultural Research*, January 15, 1915.)

The gutta percha tree is more limited in its distribution than the rubber-producing plants, owing to its climatic requirements. According to the *Botanical Journal*, which gives an interesting account of this tree, it is practically confined to the Straits Settlements. The life of India rubber is strictly limited; gutta percha, on the other hand, will keep its properties unchanged for a large number of years. It is obtained from the leaves by drying and pulverizing them and dissolving out the gutta percha.

Attempts are being made at Buitenzorg to improve cassava and sweet potatoes by developing strains from seedlings. According to the *Philippine Agriculturist and Forester*, Vol. III, No. 7, sixty-three varieties of cassava have been tested during the last three years, of which the best twelve are listed by name. Of these, eight are varieties obtained from Brazil, three are native Japanese, and one is a seedling. The use of seed with sweet potato promises results of surprising value.

According to the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases* for November 1914, the food value of the Jack bean (*Canavalia ensiformis*) is well recognized in German East Africa, and would be largely consumed in that country and sell readily on the European markets if it were conclusively established that the beans are not under some conditions poisonous. It appears that from experiments conducted in Germany, animals fed with relatively high amounts of crushed beans suffered no ill effects. Experience in the matter in the West Indies is at present uncertain.

An interesting note appears in the *Journal of the Chemical Society*, Vols. 107 and 108, on the occurrence and significance of manganese in the seed coat of various seeds. The amount of manganese present was found to vary considerably in different parts of the same seed. Experiments are recorded which show that there is a close connexion between the amount of manganese and the presence of oxidases in plant tissues, and it is therefore considered probable that the accumulation of manganese in the seed coat bears an important relation to the vital processes in seed formation and germination.

The proceedings of a Second Indian Science Congress is reviewed in *Nature* for March 11, 1915. In the Agriculture and Applied Science Section, Dr. H. H. Mann, of Poona, presided, and his address dealt with the lines of development of Indian agriculture. In this reference was made to the unsatisfactory results obtained in the average Indian cultivation. The yield of wheat in that country was not more than 10 bushels per acre, compared with 30 in other countries; the cotton produced per acre was about 75 lb. lint against 200 lb. per acre obtained in America; while sugar-cane, even when grown under irrigation, yields under 1 ton of raw sugar per acre as against the world's average of about 2 tons at least. There is scope, therefore, for the application of science to agriculture in British India.

STUDENTS' CORNER.

BEE-KEEPING IN THE WEST INDIES.

Of the two or three insects which are reared and kept by man for the economic value of their products, the bee and silkworm are the most important. The agricultural entomologist has usually to deal with this immense division of the animal world as pests, foes to be combated or eradicated if possible. Bees are certainly the most widely cultivated of these economic insects, some species or other being valued throughout the world for their productions, honey and wax.

Some fourteen or fifteen years ago, considerable interest seemed to have been aroused in the smaller West Indian islands in bee-keeping, owing to the efforts of the Imperial Department of Agriculture. A bee expert, Mr. W. K. Morrison, under the auspices of the Department, visited all the islands of the Windward and Leeward Governments, and also Barbados, and gave lectures and instructions in bee-keeping, the substance of which was afterwards published, as Pamphlet No. 9. This interest has largely diminished of late years except in St. Lucia, perhaps because it was soon seen that bee-keeping in the West Indies could hardly be depended upon alone as a means of livelihood.

It would seem, however, that bee-keeping is admirably adapted for adding to the income of any one who has a little time to spare to give the necessary attention to it. In fact it involves so little labour that in many parts of the world, notably in Jamaica, ladies are largely interested in it, to the benefit not only of their pockets, but also of their health and their mental powers. The value of the export of honey and wax from Jamaica is over £15,000 per annum.

To be a successful bee-keeper, whether with one or in hundreds of hives, it is necessary to study and observe their ways, and such study must greatly assist to foster the habit of taking notice of all sorts of other things in the world of life, animal and vegetable. Bee-keeping also calls for being out-of-doors, though not in the heat of the sun—a most healthy manner of life.

Apart from the intrinsic value of the honey and wax produced by them, bees are very valuable assistants to growers of crops the yield of which depends on the fertilization of the flowers for the production of fruit. Hives of bees kept among lime trees or in orange groves help to secure a large yield, because by the visits of the bees a larger number of flowers are fertilized, and set in fruit. The same rule probably applies to all tropical fruit, notably avocado pears and mangoes. Very likely larger bunches of coco-nuts are induced also by the visits of bees, which can be observed as constant visitors to the newly opened flowers of this palm. In temperate climates it is well known that the visits of bees to leguminous plants are most beneficial, if not indispensable to secure a large crop. An interesting point for observation, in case of bean crops being tried in the West Indies, would be the effect of keeping bees within reach of them. As to the food supply for the bees from other than cultivated plants, the West Indies afford an inexhaustible supply of nectariferous flowers, from the unrivalled logwood to the otherwise poisonous manchineel.

Considering the attention that is being paid at present to encouraging new food-producing industries in these islands, it may be worth while to draw attention to this, if only as a by-production. Although not very remunerative, honey and wax do pay the patient, careful, and observant bee-keeper, as is proved in Jamaica, and in St. Lucia to a minor extent, where the industry is growing. There is always likely to be a sale for honey of good quality, if produced in marketable quantities, in larger countries. Quite lately enquiries have been made from Canada as to the possible supply of honey from these islands, and encouragement given as to the ready sale of it there.

Anyone who wishes to try bee-keeping for any of the reasons mentioned above, even by beginning with one hive or two—and that is enough for the beginner—ought first of all to get some knowledge of the subject, which Pamphlet No. 9, of the Pamphlet Series of the Agricultural Department, will give.

THE GASES OF SWAMP RICE SOILS.

The first paper on this investigation by W. A. Harrison, M.Sc., and P. A. Subramania Aiyer, B.A., of the Madras Department of Agriculture, was dealt with in the *Agricultural News* for January 3, 1914. In this it was shown that the gases formed in the soils under consideration appeared to have an important connexion with the aeration of the roots of the crop. This was believed to be in some way dependent upon the surface film of micro-organisms. In order to determine the action of the soil film upon soil gases, a series of experiments was subsequently undertaken from the results of which the following important conclusions have been arrived at (see *Memoirs of the Department of Agriculture in India*, Chemical Series, Vol. IV, No. 1):—

1. The organized film in contact with the surface of swamp rice soils utilizes the soil gases in such a manner as to bring about an increased oxygen output from the film leading to a correspondingly increased root aeration.

2. The film contains bacteria which possess (1) the power to oxidise methane and hydrogen, and (2) to assimilate directly methane and carbon-dioxide. These changes either directly or indirectly result in the production of CO_2 which is in turn assimilated by the green algae with the evolution of oxygen.

3. The film may be looked upon as fulfilling the duty of an oxygen concentrator at a point which enables the maximum oxygen concentration to be produced in the water entering the soil.

4. The practice of green manuring by increasing the output of the soil gases brings an increased activity on the part of the film resulting in an increased oxygen production and root aeration. An important indirect function then of green manuring is to bring about a greater root aeration and so induce greater root development and cropping power.

5. The oxygen concentration of the water entering the soil appears to be one of the main factors which regulate the growth of the crop.

An announcement in the *Journal of the Royal Society of Arts* states that some interesting experiments will be made during the coming spring, in Italy, in connexion with the employment of electric power for ploughing and other agricultural operations. The trials will take place on a rice farm in the Province of Novara, and will be open to foreign as well as to Italian makers. Substantial prizes, as well as payment for the land ploughed are offered. It is stated that in the district under consideration electric energy can be obtained at a low cost by means of the numerous rivers and torrents which flow on the Italian valleys of the Alps.

FUNGUS NOTES.

A BACTERIAL DISEASE OF LACHNOSTERNA GRUBS.

It has often been observed in the course of investigations in the Lesser Antilles with regard to the grubs of *Lachnosterna* spp., and the allied *Phytalus smithi* (the brown hard backs), that the larvae in the field are subject to an affection which causes shiny black patches to appear on the skin; further, that larvae may often be found showing various stages of an affection of the legs, which commences as a black spot and results in one or more joints being lost; lastly, that a very large proportion of the specimens collected alive for study, unless they are dug up, handled and transported with extreme care, quickly become sluggish, turn dark brown, and die.

Phenomena, which from the descriptions given are strictly comparable with these, have been the subject of an investigation in Michigan by Miss Zae Northrup, the insects concerned being *Lachnosterna* spp., which are very destructive to crops in that State. The results of the enquiry are published as *Technical Bulletin No. 18* of the Michigan Experiment Station.

A bacterium to which the name *Micrococcus nigrofaciens* is given was isolated from diseased larvae, and cultures on artificial media were used for infection experiments. Uninjured Lachnosterna grubs were not infected when placed in inoculated soil, but one specimen in which an incision was made developed a black spot on the site of the wound. Other attempts failed owing to the difficulty of making incisions which were not of themselves fatal.

An attempt to transmit the disease to cockroaches (*Periplaneta americana*) resulted in infection and loss of portions of the legs of two of these insects.

The larvae of an Allorhina, belonging to the same family as Lachnosterna, were placed in inoculated soil and developed spots, but since later collections showed the spots when received, infection may very well have been also present from the beginning on the earlier examples.

It is to be noted that under ordinary conditions the disease is not claimed to be particularly fatal. Larvae infected with it lived for weeks or months. In the case of a consignment of Allorhina a large percentage of the naturally infected larvae developed into beetles, although only 4 per cent. of them were regarded as free from infection when received.

Excessive watering of the soil in which infected larvae were kept led to their early death, but in view of the delicate constitution of these grubs, and in the absence of recorded controls, it would not be safe to assume that death was in any way connected with the infection.

It is recorded that although the affection had not been observed in Porto Rico yet 100 per cent. of a consignment of larvae from that island were more or less infected.

Reference is made to the common occurrence of a gas-producing bacillus associated with the disease, and the author is uncertain as to the part played by the two organisms in the origin and especially the fatality of the disease. In a footnote it is explained that the rapid browning of the diseased larvae, first regarded as a generalization of the affection which causes the black spots, is most probably due to the invasion, secondary or primary, of the above-mentioned gas bacillus, which appears to be similar to Krassilstochik's bacillus of insect septicaemia, *B. septicus insectorum*. Apparently the rapid decline of many of the larvae brought in from the field, referred to at the outset of this review, is accompanied by the general development of this or a similar bacterium. In the experience of the present writer with *Phytalus smithi*, the amount of loss from this cause has been proportional to the care taken in handling the larvae, and not to the previous infection with the black spot disease. Some of the insects bearing the spots are amongst those which survive when many apparently quite free from them are lost.

Miss Northrup's paper, while contributing to our knowledge of bacteria in relation to insects, cannot be regarded as establishing the existence of a fatal bacterial disease of Scaraboeid larvae.

W.N.

A SUCCESSFUL INTRODUCTION OF RESISTENT VARIETIES OF GROUND NUT.

We take the following interesting note from the report of the Imperial Mycologist, India, for 1913-14:—

The relation between the incidence of the tikka disease of ground nut and the amount of cultivation and export of that crop was the subject of an inquiry during the year under review. Between 1894 and 1902 the export of ground nuts fell from 78,488 tons to 2,890 and the trade became practically extinct. The fall in the exports was due not to any deterioration in the quality of the produce, but to a marked decrease in the yield per acre, which appeared to be the result of the fungal disease, known locally as tikka [*Septogloeum arachidis*]. Treatment with fungicides had no effect in stopping the disease and, in 1902, the Bombay Department of Agriculture commenced the introduction of exotic varieties. These varieties were also attacked by tikka, but some, which ripened early, did not have their yield appreciably affected. Two varieties from Japan were especially useful in forming their nuts before the disease was sufficiently established on them to damage the produce. As a result of this, the exotic varieties, introduced by the Bombay Department of Agriculture, have now replaced the indigenous in all districts except the Poona district. Moreover, by 1912 the tikka disease had decreased to such an extent that, in the whole Bombay Presidency, diseased specimens could only be obtained on the Manjri Farm. Coincident with the introduction of exotic varieties and the decrease in the amount of tikka disease the exports began to rise. In 1902 they were 2,890 tons, in 1906 they were 6,527 tons, in 1909, 23,934 tons, and in 1912, 48,801 tons. This is probably one of the most marked cases on record where a crop disease has been checked and a trade rejuvenated by the introduction and acclimatization of new varieties.

An instructive article on the planting of Manihot rubber in the French Congo appears in the *India Rubber World* for March 1, 1915. This rubber requires a dry climate and the trees are planted 12 to 15 feet apart. Notwithstanding its poor results, the fish bone method of tapping is still in use in the Congo, but the employment of this method frequently leads to the illtreatment of the tree. Other methods have been recommended in consequence, one which is gaining favour, being the German Lewa method. Some plantations grow Manihot directly from seed: the larger plantations, however, follow the nursery system, later transplanting the stumps to their proper places

THE GROUND WATERS OF ANTIGUA.

Two papers appear in the *West Indian Bulletin* of this Department (Vol. XIV, No. 4), on the water-supply of the island of Antigua. The first concerns the geology of the island's ground waters and discusses the possibility of obtaining an artesian supply. It is concluded that no supply of artesian water may be expected in Antigua, and the development of an adequate supply must be expected from different sources. These are summarized as (1) shallow wells in the limestone district; (2) shallow wells in the alluvial fillings along stream-ways and at the foot of talus slopes in the south-west volcanic district; and (3) impounding water, especially in the volcanic district where it appears there are valleys adapted for damming.

The second paper, dealing with the ground waters of the island, adopts a chemical rather than a geological treatment. It is concluded in this paper that in the limestone districts there are good prospects of obtaining supplies of underground water at suitable points. The various factors that must be taken into consideration in the sinking of wells are given, and it is pointed out that additional care must be exercised when conducting boring operations, to avoid passing through the limestone strata and penetrating the underlying rock which contains saliniferous deposits. In sinking wells in the alluvial fillings of the southern district of the island care must be taken not to approach too close to the bases of the surrounding hills. In the central plain, the saline deposits appear to render a water-supply impracticable, but to the south of this region the erection of dams should serve a useful purpose. It is stated that the locality in question offers special advantages for the erection of dams, inasmuch as the close-textured character of the soil and subsoil renders it difficult for water to penetrate through it. On this account, reservoirs constructed by erecting dams at suitable points in the south of the central plain will not be subject to loss of water by seepage, and in consequence, the necessity for puddling the interior with clay in order to ensure retention of water, will be removed.

The importance of the question of water-supply in Antigua and in similar geological areas gives to the two papers briefly dealt with in this abstract a particular interest, which no doubt will be appreciated throughout the West Indies.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of January:—

Notwithstanding the German threat of a general 'blockade' of the British Coast to date from February 18 last, the month passed through without any serious losses either to Shipping or Commerce. The general condition of trade has been satisfactory throughout February, both with regard to the quantities that have changed hands and the prices realized. The general tendency being in an upward direction as far as the means of transit has been concerned, especially by shipping, there has been very little disturbance, and the same may almost be said with regard to railway transit, considering the amount of pressure of all kinds of traffic to which the railways have to submit. The following are the chief items of interest during the month.

GINGER.

This article was well represented at the first spice auction on the 3rd of the month, when 649 packages were offered and all bought in at the following rates: washed rough Cochin at 23*s.*, wormy 21*s.* to 22*s.*, and brown, rough Calicut at 20*s.* per cwt. A fortnight later, namely on the 16th, prices had advanced, good Cochin fetching from 25*s.* to 25*s.* 6*d.*, and at the end of the month as much as 26*s.* was paid, while common to good Jamaica was quoted at 38*s.* to 45*s.* and even up to 50*s.*

NUTMEGS, MACE, AND PIMENTO.

At auction in the middle of the month West Indian nutmegs were disposed of at the following rates: 60's to 70's $5\frac{1}{2}d.$ to $11\frac{1}{2}d.$, 71's to 81's $5\frac{1}{2}d.$ to $6\frac{1}{2}d.$, 82's to 92's $4\frac{3}{4}d.$ to $5\frac{1}{2}d.$, 93's to 102's $4\frac{1}{2}d.$ to $5d.$, 105's to 115's $4\frac{1}{4}d.$ to $4\frac{3}{4}d.$, 127's to 130's $4\frac{1}{2}d.$ to $4\frac{3}{4}d.$ At the same sale West Indian mace sold at 1*s.* 4*d.* to 2*s.* 2*d.* per ℔., being an advance on previous rates. At the close of the month pimento took a firmer tone, and was quoted at $2\frac{1}{8}d.$ per ℔.

At the drug auction on the 11th of the month, there was quite a fair quantity of goods offered but with a moderate number of purchasers.

SARSAPARILLA.

This article was represented at the above sale by 9 bales of grey Jamaica, 19 of native Jamaica, and 21 of Lima-Jamaica. The whole of the first was disposed of, fair to part rough fetching 1*s.* 11*d.* per ℔.; one bale only of the native Jamaica sold, fetching 10*d.* per ℔., and 4 bales of the Lima-Jamaica realized 1*s.* 6*d.* per ℔. for ordinary, and 1*s.* 8*d.* for fair.

LIME OIL, LIME JUICE, AND CITRIC ACID.

At the beginning of the month West Indian distilled lime oil was to be obtained at 2*s.* 5*d.* per ℔., but at the close 2*s.* 6*d.* was being paid freely. At the drug auction on the 11th, 4 cases of hand-pressed oil from Dominica and Grenada were offered, and bought in at 8*s.* 6*d.* per ℔. Lime juice has been getting scarce, and threatens to be more so, in consequence of the increasing demand by the Government for supplying the Navy and Army: 2*s.* 9*d.* to 3*s.* per gallon is the lowest current price, at the time of writing, for good West Indian raw juice. Citric acid has been steady through the month at 2*s.* $5\frac{1}{2}d.$ to 2*s.* 6*d.* per ℔.

Amongst other products brought forward at the auction of the month, but which found no buyers, were Canella alba bark, 4 packages; cashew nuts, 54 packages; tamarinds, 37 packages; and kola nuts, 5 packages.

A copy of the circular containing a summary of investigations made by the Mauritius Department of Agriculture, July 1 to November 30, 1914, has been received. Information is given under the three headings of Division of Phytopathology by F. A. Stockdale, Division of Chemistry by G. G. Auchinleck, and Division of Entomology by D. d'E. de Charmoy. In Chemistry a large number of cane juices, manures, and milks have been analysed. Entomological work has had relation principally to cane borers and ticks, and other parasites of animals. Phytopathology has concerned diseased conditions of the sugar-cane principally.

MARKET REPORTS.

London.—The West India Committee Circular April 6, 1915.

Arrowroot—$2\frac{1}{2}d.$ to $2\frac{9}{16}d.$
Balata—Sheet, 2/2; block, 1/11¼ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 98/- per cwt.; Grenada, 89/- to 96/6; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £26 10*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 18*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, £21; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations
Mace—1/4*d.* to 2/11*d.*
Nutmegs—$4\frac{1}{4}d.$ to $5\frac{3}{4}d.$
Pimento—Quiet.
Rubber—Para, fine hard, 2/5½; fine soft, 2/3¾; Castilloa, 1/7 to 2/-.
Rum—Jamaica, 3/ to 4/

New York.—Messrs. Gillespie Bros., & Co., March 26, 1915.

Cacao—Caracas, 16¼c. to 17c.; Grenada, 16¾c. to 17c.; Trinidad, 16¾c. to 17¾c.; Jamaica, 15½c. to 16¼c.
Coco-nuts—Jamaica and Trinidad, selects $20·00 to $24·00; culls, $12·00 to $14·00.
Coffee—Jamaica, 8¼c. to 12c. per lb.
Ginger—8¾c. to 12c. per lb.
Goat Skins—Jamaica, 45c.; Antigua and Barbados, 43c. to 44c.; St. Thomas and St. Kitts, 42c. to 44c. per lb.
Grape Fruit—Jamaica, $1·50 to $1·75.
Limes.—$6·00 to $6·50.
Mace—48c. to 55c. per lb.
Nutmegs—12½c. to 13c.
Oranges—Jamaica, $1·25 to $1·50.
Pimento—3½c. per lb.
Sugar—Centrifugals, 96°, 4·95c.; Muscovados, 89°, 4·45c.; Molasses, 89 , 4·18c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., April 19, 1915.

Cacao—Venezuelan, $17·50 to $18·00; Trinidad, no quotations.
Coco-nut Oil—81c. per Imperial gallon.
Coffee—Venezuelan, 11c. per lb.
Copra—$4·50 to $4·75 per 100 lb.
Dhal—$7·25.
Onions—$3·50 to $3·75 per 100 lb.
Peas, Split—$9·75 per bag.
Potatoes—English $2·10 to $2·20 per 100 lb.
Rice—Yellow, $6·00 to $6·25; White, $7·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. T. S. Garraway & Co., April 19, 1915.

Arrowroot—$4·00 to $4·50 per 100 lb.
Cacao—$13·00 per 100 lb.
Coco-nuts—$16·00.
Hay—$1·75 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $82·00 per ton.
Molasses—No quotations.
Onions—$4·00 to $5·00 per 190 lb.
Peas, Split—$10·13; Canada, $5·85.
Potatoes—Nova Scotia, $2·75 per 160 lb.
Rice—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, no quotations.

British Guiana.—Messrs. Wieting & Richter, February 6, 1915; Messrs. Sandbach, Parker & Co., April 16, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	$7·00 to $8·00 per barrel of 200 lb.	$10·00
Balata—Venezuela block	— —	— —
Demerara sheet	— —	— —
Cacao—Native	14c. per lb.	16c. per lb.
Cassava—	$1·08	— —
Cassava Starch—	— —	— —
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	— —	16c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	16c. per lb.
Liberian	10c. per lb.	10c. per lb.
Dhal—	— —	$7·00 to $7·50 per bag of 168 lb.
Green Dhal	— —	— —
Eddoes—	$1·44	— —
Molasses—Yellow	None	— —
Onions—Teneriffe	— —	— —
Madeira	— —	— —
Peas—Split	— —	$13·00 per bag. (210 lb.)
Marseilles	— —	— —
Plantains—	16c. to 40c.	— —
Potatoes—Nova Scotia	$2·25 to $2·40	$3·00
Lisbon	— —	— —
Potatoes—Sweet, B'bados	$2·16	— —
Rice—Ballam	No quotation	— —
Creole	$5·50 to $5·75	$5·50
Tannias—	$2·16	— —
Yams—White		— —
Buck	$2·04	— —
Sugar—Dark crystals	$3·40	$3·50
Yellow	$4·00 to $4·10	$4·00
White	$5·10 to $5·25	— —
Molasses	$2·90	— —
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
Cordwood	$1·80 to $2·00 per ton	— —

AGRICULTURAL NEWS.

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Increasing the Plant's Efficiency.

IN his address to the Agriculture section at the Melbourne meeting of the British Association for the Advancement of Science, Mr. A. D. Hall, F.R.S., referred to the inefficiency of the plant as a builder up of food material, and called attention to the necessity in the future of speeding up the bio-chemical reactions which produce carbohydrates.

'The whole of existence,' said Mr. Hall, 'is based upon the fundamental process by which the green leaf utilizes the energy of the light falling upon it to split up the carbon dioxide of the atmosphere, and transform it into those fundamental carbon compounds—sugars, starches, etc., which build up the substance of the plant. The animal creates nothing: it is only a transformer, and rather a wasteful one at that, of the compounds initially built up by the plant. Now, though the leaf is thus the prime creative force it is yet a comparatively ineffective machine for dealing with the energy contained in the light, for it does not succeed in storing up in the shape of plant materials it produces as much as one per cent. of the energy that falls upon it as light, and in bright, tropical light the percentage utilized is even less. A steam engine given a certain amount of energy in the shape of coal, turns out again about one-seventh of it in the shape of useful work, a gas or oil engine is an even more effective transformer. Can the duty of the leaf be increased so that it shall effect a greater production of dry matter for the amount of light energy it receives? We know very little as yet about even the sequence of chemical changes in the leaf beyond the fact that we begin with carbon dioxide and water and end with oxygen and some sort of sugar, we are beginning to acquire knowledge as to the extent the rate of change is affected by the supply of light, carbon dioxide, and water, and by the temperature. But we have now many examples in chemistry of reactions being speeded up or rendered more complete by means of some adjustment of the external conditions, so it is perhaps not too much to expect that this fundamental process of carbon accumulation may also be tuned up until the leaf becomes of greater efficiency than at present in producing tissue from the materials and energy supplied to it.'

The point brought out in these remarks is a suggestive one and indicates the immense field which lies before the plant physiologist. It is especially interesting in regard to the West Indies where sugar and starches constitute staple productions. Can the efficiency, for example, of the cane plant as a machine be increased, or the rate at which the cassava plant produces starch be accelerated ? It is true that an unconscious attempt to do this is made in the course of chemical selection, but that is only a very indirect way of attacking the problem, and is not likely to give results as quickly as an alteration of the conditions of environment.

One of the best-known attempts that has so far been made to hasten plant growth is by the application of electricity. Professor Priestley, with the assistance of Sir Oliver Lodge, has in England achieved considerable success in this direction, and it has been shown in a general way that there is a practical increase in the yields of crops when the growing plants are submitted continuously to the influence of a high tension, silent, electric discharge. Previously Pollacci had obtained indications that leaves can manufacture carbohydrates using the carbon dioxide in the air when they are traversed by an electric current, even when there is not sufficient light to effect the purpose. In a later paper on the subject, Priestley records the difficulty in regard to maintaining an efficient control in the open air because the wind may carry the current over from the treated to the untreated area. Although the conclusive nature of this result is thereby reduced, it is nevertheless a fact that electricity does exert an appreciable stimulation on plant growth.

Another way in which investigators have tried to speed up the plant is by means of radio-active substances. This subject has recently received attention in this journal, and it may be stated definitely that the influence of these substances is beneficial. It is only a question of cost which limits the success of the treatment commercially, and when radio-active by-products become cheaper, there is every possibility that they will be utilized in agriculture. The utilitarian aspect is, however, not of primary importance from our present point of view. In fact the criticism seems justified when we say that in regard to both electrical and radio-active influence, investigators tend to put the cart before the horse when commercial trials are made before the physiological or purely scientific side has received fuller attention. The present problem of increasing the plant's efficiency is not merely one of nutrition but a problem which touches on the physical basis of life. It consists in an endeavour to adjust the properties of protoplasm to external conditions, and such an endeavour requires the application of research.

Very interesting results have been obtained in regard to the influence of shade upon assimilation. The Florida work in connexion with tobacco is probably well known to most persons. The idea originated from a chance observation that some Sumatra tobacco grown near trees where it had been partially shaded was superior in quality to the rest of the field. Experiments were then begun to produce tobacco under artificial shade. The first method of shading was with lattice work which produced good results, but on account of the ease of erecting, openly woven cotton cloth has replaced the lattice work. After a few years of successful work in Florida, the idea was taken up by other States, and now growing tobacco under shade is an important industry not only in the United States but in South Africa, Java, and other countries. It is of interest to record that this method of cultivation has been tried locally in St. Kitts with highly satisfactory results. The point to bear in mind in connexion with this work is that it consists in producing a change in the activity of the plant cells, in a re-adjustment of functions, and is on a different plane altogether to the influence of soil nutrients.

Observations have been made in Java as to the meteorological conditions obtaining under these shade tents. The average temperature during the day under the tents is higher and the maximum temperature lower than in the open. The minimum temperature recorded during the night was higher under the tent, and the temperature of the covered soil was at all times lower than on the control plots. The relative humidity of the air under the tents was higher than in the open, but the rainfall reaching the covered soil was much less than the rainfall on the unprotected plots.

It is probable that the absence of extreme temperatures and the increased humidity enable the stomata in the leaves to remain open longer, take in more carbon dioxide, but give out less moisture than in the open. Ball's work in the cotton plant in Egypt has shown that the gaseous interchange between the leaves and the air is practically arrested during the hotter hours of the day, and the results of the effect of shade on tobacco tend to be in agreement.

Still another way in which the efficiency of the leaf may possibly be increased is by a modification of its anatomy. A leaf by means of certain contrivances can shade itself. The writer has shown this

occur in the case of the sugar-cane. Curling is a phenomenon designed to protect the stomata, as is also the situation of these pores under the side of the leaf. It would seem reasonable to expect that if the stomata could be efficiently protected during the hot hours of the day, their period of active assimilation would be increased. Possibly the capacity of a leaf would be increased if nearly all the stomata were situated on the under surface. The chief function of the upper surface is to absorb radiant energy and not to assimilate and transpire. This is shown by the fact that the stomata are very much more numerous on the lower than the upper surfaces. The effects of increasing this ratio by selection would seem worth investigating.

If the whole subject of increasing the plant's efficiency is a speculative one, it is nevertheless full of possibilities. The main idea which we have endeavoured to put forward in this article is the need for more research on the plant above ground in relation to its environment. Much has been done to increase the efficiency of root action, but little to accelerate the functions of the leaf. And yet, as Mr. Hall observes, 'the whole of existence is based upon the fundamental process by which the green leaf utilizes the energy of the light falling upon it to split up the carbon dioxide of the atmosphere.'

SUGAR INDUSTRY.

ACTION OF MICRO-ORGANISMS IN CANE JUICES AND SYRUPS.

It might not be expected theoretically that there can be any considerable loss of sugar while juice is passing through the factory, yet in practical working, trouble is encountered and loss is sustained through the action of certain fungi and yeasts. These organisms gain entrance to the sugar factory in earth adhering to the roots and rind of the canes. As the juice passes from the mills there is not time nor opportunity for the development of these organisms except in connexion with the circumstance that in spite of the steady current of juice there are always nooks and bottoms where the juice remains in place, and there the germs can undergo reproduction. Such places are for instance, bottoms of the juice receivers, where the suction pipe does not reach the bottom and where constant stream of juice runs in and is pumped out, and where in an inclined place at the bottom, a part of the juice may remain undisturbed. The same thing is often met with in monte jus where, too, the pipe through which the contents are discharged may end some length above the bottom and thereby create a dead stop where the juice remains still. It is admitted that the quantity of juice in these places is not large, but as will be shown in a subsequent paragraph, these are capable of starting sufficient growth to interfere with the proper working of pipes and to infect the whole sugar house with the unwished-for organisms.

One of the worst organisms in the cane sugar factory is the well-known *Leuconostoc mesenterioides*, the so-called frogspawn organism, which, rather repeatedly, is found in cane juices. In alkaline juice this fungus develops with remarkable rapidity and is able to attack the sucrose, producing a gummy product known as dextran, which clogs up pipes and plugs of cocks and thereby causes considerable trouble. An interesting instance of where this has happened is referred to by Dr. Prinsen Geerligs in an article on the present subject in the *Louisiana Planter*. It appears that at a factory in Java great difficulty was suddenly encountered in connexion with the filtration of the mud. The layer of mud deposited from the juice was much thicker than usual, which increased the work expected from the filter presses, while at the same time the filter-press cakes showed a much larger water content than was customary. Analyses and other forms of enquiry failed to furnish a reason for the disagreeable phenomenon, and it was only discovered when the factory was cleaned at the ordinary time fixed for that work, that great lumps of Leuconostoc existed in the pipes, cocks, and on the bottoms of the apparatus between the mill and the juice heaters. As soon as these were removed and the pipes were disinfected everything returned to a normal condition of working.

A second fungus has been found in Java in cane juice, known as *Oidium terricula*. This organism occurs in the earth adhering to the cane roots. The fungus does not attack sucrose, and is in this respect to be considered harmless, but it forms acid from the glucose, and even acid having soluble lime salts, so that the action of the Oidium in cane juice is apt to cause an increase in the lime salt contents of the juice, and accordingly increases the amount of molasses to be expected ultimately. Lactic acid bacteria encountered in the soils of cane fields are also responsible for loss of sugar in molasses and, moreover, they can also attack sucrose. As all organisms are killed by high temperatures, the remedy against the Oidium and lactic acid ferments is rapid work and disinfection with sodium fluoride. In conclusion it may be stated that a fertile source of infection are automatic samplers. It is perhaps better and certainly safer to adopt the direct method of sampling with simple glasses or tins, which may be washed after use, thereby preventing the accumulation of infection.

Farming with Dynamite.—*Tropical Life* for March 1915 records results of experiments carried out at Tarquah Agricultural Station, Gold Coast, in the use of explosives in the cultivation of Para rubber and cacao trees. In one of these experiments the explosive used was dynamite 40 per cent. In a second experiment the rubber trees were all the same size, and deeper holes and larger charges were used, whilst in the case of the experiment for planting cacao trees the soil was spread up to about 2 feet 6 inches depth. The first experiments were carried out in August 1913, the girth measurements being taken on the dates given in the table. From this it is seen that the trees which were experimented on show an increase in growth when compared with trees not so treated. These were 15 feet apart. Explosives (dynamite?) were placed 10 feet apart in holes 18 inches deep, one cartridge being placed in each hole. The conviction is expressed that the use of explosives will be recommended on the West Coast of Africa as it has been in the West Indies and the East, so that its use in agriculture will become much more general.

FRUIT AND FRUIT TREES.

THE HANDLING OF ORANGES, GRAPE-FRUIT AND PINE-APPLES.

One of the principal difficulties attendant on the production in the West Indies of fruit for export is its successful transportation from the estate to the consumer. This matter has recently received attention in Porto Rico with regard to oranges, grape-fruit and pine-apples, which are supplied in considerable quantities to the market in New York. Last year complaints were put forward to the effect that a considerable percentage of the fruit arrived in a decayed condition, which resulted in the United States Department of Agriculture instituting an investigation of which Bulletin No. 7, issued by the Government of Porto Rico, is the outcome. This Bulletin describes the nature of the causes of decay, and provides a full account of the methods adopted in Porto Rico in the picking, cleaning, grading, storing, and transportation by steamer of the produce in question.

The immediate cause of decay in these fruits is the growth of fungi resulting from, in most cases, mechanical injury. In the case of citrus fruits two fungi, at least, are responsible for the damage: a blue mould (*Penicillium* sp.), which is quite saprophytic, and a Diplodia, which is partially parasitic. In the case of pine-apples, a Penicillium is also probably capable of producing harm, though the so-called 'storage rot' is due to *Thielaviopsis paradoxa*—a fungus which produces in this fruit the characteristic ethereal odour.

The damage caused by these fungi has from time to time received the attention of the Imperial Department of Agriculture, and a useful article on the decay of pine-apples will be found in the *Agricultural News* on page 222 in Vol. XIII. The decay of citrus fruits was given consideration by this Department at the time when the so-called 'new worm' on oranges was reported to be prevalent in a district in Dominica. Although the points to be observed in the prevention of decay were given in connexion with these references, it will prove instructive to put forward a short account of the recommendations made by the Porto Rican authorities, since in this island the different fruits in question are handled on quite a large and apparently well-organized scale.

Mention has been made above of the fungi which are capable of inducing decay; but it cannot be over emphasized that the secret of prevention lies in a careful avoidance of even the smallest mechanical injury during handling, the avoidance of all unnecessary delay in shipment, and the provision of thorough ventilation. Turning more particularly to what the Bulletin says concerning the handling of citrus fruit, it may first be noted that in picking this fruit it should first be severed from the tree with a stem $\frac{1}{2}$-inch long, and this should be trimmed off closely and carefully when held in plain sight. There is then no danger of leaving a long or jagged stem. Picking sacks are more satisfactory for careful handling than baskets, because with a sack the mouth can be partly closed so as to make it impossible for the picker to drop fruits into it. The practice of dropping or laying the fruit on the ground should be avoided, and the fruit should be conveyed as quickly as possible in field-boxes to the packing house. In regard to cleaning the fruit—which is done in the case of Porto Rican grape-fruit but usually omitted in the case of oranges—the fruit is washed in wet roll brushes to remove the purple scale, sooty mould or dirt. It is then polished by means of a machine, and after running along a sorting table passes down steep runs into the bins. These steep runs are the principal sources of mechanical injury, but to avoid risk of injury in any part of the operation none of the fruit should be washed at all unless absolutely necessary to render it marketable. If the fruit has to be washed, a spray of water containing a trace of copper sulphate is less objectionable than the use of a soaking tank.

The last matter given attention to in the Porto Rican Bulletin concerning the handling of citrus fruits is delay in shipment. The practice of curing is undesirable when it causes delay in this respect. When fresh fruit is firmly and properly placed in the box it is no more liable to make a slack pack than is cured fruit. It is maintained that careful handling in all stages of transportation, and prompt shipment are fundamental. An experiment is quoted describing how one lot of fruit was picked seven days and another one day before loading on the steamer. When the fruit was inspected on arrival in New York, the lot held for seven days before shipping showed a decay of 16·5 per cent., whereas the other lot had developed 2·4 per cent. of decay. Thorough ventilation in all stages of transportation is essential.

The recommendations made in regard to lessening the decay of Porto Rican pine-apples include, as in the case of citrus fruits, a reference to the care required in the removing of the fruit from the plant by cutting. Damage resulting from this operation should be avoided. Dropping the pine-apples into picking baskets is objectionable, as is also the rubbing of unwrapped pine-apples in the field crate. This latter is likely to cause spine punctures or other injuries when the fruit is hauled over rough roads, or when the crates are handled carelessly. It is said that in Porto Rico improperly built or faulty sizing machines damage the fruit by allowing it to drop or roll forcibly against the sides of the bins or to strike against other fruits. The packing bin should be padded on all sides and the bottom should be made of canvas or similar material. In packing, the greatest care is necessary to prevent bruising the fruit by allowing it to strike or press against the sharp edges of the slats of the crates. A high bulge on the top layer should be avoided as it may result in serious bruising from pressure of the lid. The shipping of green or immature pine-apples as a means of preventing serious loss from decay which develops in ripe fruit as a result of rough handling should be discouraged. Green pine-apples cannot be matured artificially, and consequently a place which supplies them will soon gain a bad reputation, not to mention unprofitable prices. As in the case of citrus fruits, prompt shipment after picking is essential. But it is also essential that the fruit should be kept at a low temperature on the steamer. It is worth recording here that the British West Indies have an advantage over Porto Rico in that the steamers calling at Porto Rico do not possess cold storage accommodation. It is stated in the Bulletin that the development of much of the decay in pine-apples now found on arrival in New York could be checked by the installation on shipboard of proper refrigerating devices.

West Indian Awards at the Toronto Exhibition, 1914.—Brief information has been received from Messrs. Pickford & Black, Ltd., to the effect that the following awards have been made for the West Indian Court Exhibit at Toronto last year: Gold medal, Barbados; Gold medal diploma, Jamaica and the Bahamas; silver medal, British Guiana, Grenada, St. Vincent, Montserrat, Antigua, St. Kitts-Nevis, and the Virgin Islands.

SELECTION OF COCO-NUTS FOR PLANTING.

As the result of an enquiry started by this Department into the question of the desirability of using coco-nuts from young trees for planting purposes, the Royal Botanic Gardens, Kew, has given the matter attention, and an interesting article on the subject has just appeared in the *Kew Bulletin* (No. 2 of 1915). The greater part of this information is reproduced herewith:—

In connexion with the propagation of coco-nuts, it is a widely held belief that the nuts from young trees should not be used, and that plants should only be raised from fully matured trees.

This belief appears to be based on the following passage from Simmonds's *Tropical Agriculture*. The nuts for sprouting should be chosen from those fully ripe, having full, large eyes, and such as have been gathered from trees past the middle age—not, however, from aged ones—and from clusters containing few fruits. . . . Those nuts which may be taken from trees of immature age, will, if planted, rot away at the eye; and the plants, if any be successfully reared, on transplanting will grow very rapidly and acquire bulk, but the fruit will drop before the kernel acquires consistency, the root stalks break, and the trees entirely fail before mid-age.

Efforts have been made to discover what truth there may be in the above statement, for neither direct confirmation nor absolute refutation has been obtained. On physiological grounds there would appear to be no justification for the statement as it stands, though no doubt it would be unwise for more than one reason to plant nuts from young trees in the first year or two of their coming into bearing.

The article here reproduces a paragraph from Copeland's recent work, in which it is stated that seed nuts should be selected from trees which are neither very young nor very old. Nuts from young trees may not show their true characters. Attention is also given to Prain's *Botany of the Laccadives* chiefly in respect of the yields obtained in those islands. Continuing, the writer proceeds to discuss facts that have been furnished in regard to a plantation in the West Indies:—

Judging from particulars received of coco-nut plantations in the island of Nevis, West Indies, it would appear that coco-nut palms in their third year of bearing yield perfectly sound and full-sized nuts, which, when used for seed, can be relied upon to germinate freely and in a normal manner.

The plantations in Nevis were started by Mr. Crum-Ewing in the autumn of 1907 on old sugar-cane land, which is almost at sea-level. The soil is a nice loam, gradually getting lighter until it becomes pure sand on the sea-shore.

The average rainfall for the years 1909-13 inclusive was 43·87 inches, but the deficiency is compensated for by the plentiful underground supply of water draining from the high cone-shaped mountain which forms the centre of the small circular island of Nevis.

The seed was obtained from Jamaica by Mr. Barclay, Secretary of the Jamaica Agricultural Society, who took some trouble to obtain nuts from the most healthy plantation in that island. The seed for that plantation in turn came from San Blas, whence come the finest nuts in the Western Hemisphere.

The number of nuts planted up to the end of 1911 amounted to 10,305. The trees are planted 28 feet apart, or fifty-two to the acre. Certain trees commenced to bear in 1911, and Mr. Crum-Ewing saw one early in 1912, four years four months old, bearing forty nuts. Reaping in any quantity, however, did not commence till 1913, when the 1907 plants would be about five years three months old.

From January 11, 1913, to June 30, 1914, the number of nuts harvested amounted to 23,807. From January 11 to October 23, a 4-inch gauge was used which resulted in 77·4 per cent. of selects and 22·6 per cent. of culls. Both selects and culls were sent to New York, where the market took both grades as select, paying $42·50 for 1,000, about the highest price which has been paid for any coco-nuts in that city. Since October 23 a $3\frac{7}{8}$-inch gauge has been used (which is $\frac{1}{8}$-inch. larger than the Malay regulation gauge of $3\frac{3}{4}$-inch), and of the 75,116 nuts gathered, 68,419, or 91·08 per cent. have been select, and 6,697 or 8·92 per cent. have been culls. A selection is made in the field of the nuts while in the husk, and it is found that 95 per cent. to 98 per cent. of these nuts when husked are over the $3\frac{7}{8}$ gauge. . . .

Out of 1,000 seed nuts sent to Demerara in July 1913, it was reported on February 28, 1913, that 89 per cent. of these had germinated, that the others seemed quite good, and that more were expected to grow. In March 1913, fifty nuts were planted standing up and fifty on their sides by way of experiment in Nevis. On October 24, 1913, it was reported that out of the fifty on their sides forty-six, or 92 per cent. had germinated, and of those standing up only thirty or 60 per cent. had germinated.

The high percentage of good-sized nuts on the young plantations at Nevis is of both general and commercial interest, and affords ample justification for the great trouble which was taken in selecting the original seed nuts in Jamaica and elsewhere. As to the selection of the seed Mr. Crum-Ewing writes: 'I do not understand Simmonds's advice to take seed nuts from clusters containing few fruits—on a prolific tree there should be no such clusters. I quite agree with you that seed nuts should be taken from trees whose good character is well marked. It appears to me that the pedigree of a coco-nut tree is of the utmost importance. Even if I had one or two years' experience of a tree, and it showed the same characteristics, for which its parent, and yet again it grand-parent had been selected, I would rather use the seed from that tree than take Simmonds's advice to choose one picked from a sparsely furnished cluster grown on a tree passed the middle age, of whose parentage there was no record.'

The nuts which are now being planted on Mr. Crum-Ewing's land in Nevis and in Demerara are taken from the young trees planted in Nevis in 1907. As already mentioned, the germination percentage of the nuts sent from Nevis to Demerara in July 1913 was 89 per cent., which certainly refutes the statement made by Simmonds that nuts from young trees 'rot away at the eye.' Mr. Crum-Ewing informs us that he is planting nothing but his own Nevis seed both in the island and in Demerara, and adds: 'I feel justified in so doing, knowing the great care with which the seed is selected, the minute observation to which the individual trees have been subjected, the absence of disease in the grove and in the island, and the good stock from which the parents and grand-parents were derived.'

These experimental plantings should, in the course of a few years, enable a proper estimation to be made of Simmonds's statements, but in the light of the practical experience already gained, it seems highly unlikely that his recommendations will receive support.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date April 20, with reference to the sales of West Indian Sea Island cotton:—

About 100 bales of West Indian Sea Island cotton have been sold since our last report, chiefly St. Kitts 16*d.* to 17*d.*, with an exceptional bag at 19*d.*

The demand is necessarily very limited and spinners are only purchasing such small quantities as they want for their immediate requirements.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended April 17, is as follows:—

There was a good demand for the odd bags of Fine to Fully Fine, at 22c. to 23c., resulting in sales of about 150 bales, the buying being on account of the Northern Mills, leaving in stock about 200 bales, which are held at 1c. to 2c. higher.

Besides the above there was more inquiry for the Planters' crops for export, and six crop lots are reported sold at prices ranging from 23c. to 25c., aggregating about 150 bales. These sales have reduced very much the unsold stock, which is firmly held on a basis of quotations.

We quote, viz:—

Extra Fine 23c. to 24c. = 14*d.* to 14½*d.*, c.i.f. & 5 per cent.
Fine to Fully Fine 23c. = 14*d.*, „ „ „ „
Fine, off in colour 18c. to 20c. = 11½*d.* to 12½*d.* c.i.f.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, and Manchester, up to April 17, 1915, were 103 and 1,651 bales, respectively.

British Cotton Growing Association.—At a recent meeting of the Association, a letter was received from the Sirdar of the Soudan in which great appreciation was expressed with regard to the Association's help in financing the cotton crop, and it was also stated that it will be of great benefit to the future of cotton growing that in a year like the present the cultivator should have been provided with an opportunity of selling his cotton on the spot for cash.

In regard to the purchases of cotton at Lagos in West Africa up to March 27, the figures are low. They amounted to 701 bales as compared with 7,898 bales for the same period of last year, and 6,586 for 1913. It is impossible at present to ascertain the size of the crop, but the Association's manager at Lagos reports that the prospects are very fair, and that it is possible the cotton is being held back by the natives in the hope of a higher price, 4*s.*, being offered. Owing to the recent rise in cotton prices, the Council has decided to increase the minimum buying price which had previously been fixed for this season.

In Northern Nigeria the purchases to the end of February amounted to 82 bales as compared with 172 bales for the same period last year.

Operations in connexion with cotton production in Nyasaland and Uganda are stated to be satisfactory.

Fumigation of Egyptian Cotton Seed. *The Board of Trade Journal* publishes the following note in regard to Egyptian cotton seed:—

H.M. High Commissioner for Egypt reports to the Foreign Office that the Egyptian Ministry of Agriculture is anxious to call the attention of all purchasers of Egyptian cotton seed to the desirability of insisting on its fumigation at the port of shipment, with the object of destroying the pink boll worm which it may contain.

It is almost certain that this parasite first reached Egypt in bales of imperfectly ginned cotton from India, and it is very probable that it will be introduced into other countries where Egyption cotton seed is sown unless the seed is previously fumigated.

With a view to eradicating the pink boll worm in Egypt measures are being taken to introduce a law requiring the fumigation of all cotton seed in Egypt.

It will be some time before these measures can be universally adopted owing to the absence of adequate machinery, but in the meantime the Ministry of Agriculture is ready to fumigate small amounts of seed, supplying a certificate of fumigation with the consignment.

A Use of Sea Island Cotton.—It is a very well-known fact to most people interested in Sea Island cotton that this material finds an important use in the manufacture of motor tyres. It is of interest to record that in *The Times* for March 13, 1915, a striking advertisement appears notifying the fact that the Goodrich Co., Ltd., entirely uses Sea Island cotton as the fabric for the foundation of their tyres. It is stated: 'there is as much difference between the value of the best cotton and the worst as there is between cotton and silk. The very finest cotton is the true Sea Island, grown in certain districts of Florida and the West Indies. Its quality in length and fineness of staple is extraordinary.' The above advertisement is one of the first that has been noticed in regard to the virtues of Sea Island cotton. It might have been rendered more strictly accurate however, if the point had been brought out that the finest cotton is produced in the British West Indies rather than in Florida.

Cotton in Barbados.—The Blue Book of this Colony for 1913-14 contains a comparative table showing the cotton exported from Barbados during the calendar year. But the reaping and shipping season for a cotton crop extends from October to the following September, so that the following table giving the comparison by crops and not by calendar years is more significant:—

	Crop. 1912-13.	Crop. 1911-12.	Decrease.
Acres	3,970	4,669	699
Quantity, lb.	424,392	455,689	31,297
Value	£23,222	£28,112	£4,890

According to *Colonial Reports* (No. 824) on the Blue Book referred to, the steady reduction of area under cotton is due to the discouragement caused to planters by the susceptibility to disease and insect pests. The efforts of the Local Department of Agriculture to obtain, by selection and hybridization, varieties capable of resisting insect pests and fungoid diseases, and of giving a yield satisfactory in both quantity and quality are being continued. Another reason, it may be added, why the returns have decreased is the insufficient attention given to cultivation, and to the absence of a close season, which if established would make it possible partly to eliminate the pests and diseases referred to as the principal cause.

TRADE AND AGRICULTURE OF JAMAICA.

The Report on the Blue Book of Jamaica for the year 1913-14 is issued as a supplement to the *Jamaica Gazette* of January 28, 1915. From this, the following interesting information as regards the trade and agriculture of the Colony during the period reviewed, is abstracted.

The total exports for the year amounted in value to £2,430,207. Of this sum, the proportion attributable to island produce was £2,216,211, as against £2,572,275 in 1912, or a decrease of £356,064. This decrease in the value of island produce exported as compared with 1913 is made up principally of bananas, £252,951; cacao, £25,095; coffee, £16,152; ginger, £11,400; honey, £3,100; yams, £1,018; logwood extract, £5,240. The growth of the total export trade of the Colony in the forty years since 1872, given in periods of ten years, is shown to be as follows:—

1873	year ending September 30	£1,226,011
1883	„ „ „ „	1,469,446
1893	„ „ March 31	1,759,806
1903	„ „ „ „	2,292,335
1913	„ „ December 31	2,430,207

In this connexion figures also are given showing the trend of trade; the markets accepting the island's exports in each of the years specified, and the percentages falling to each, being as follows:—

	1873.	1883.	1893.	1903.	1913.
	%	%	%	%	%
United Kingdom	51·5	54·5	29·1	19·0	17·5
United States	8·4	19·8	54·3	68·0	57·4
Canada	·3	16·7	2·6	2·4	3·7
Other Countries	9·8	9·0	14·0	10·6	21·4

Turning to agriculture it is found that the acreage returned in 1912-13, grouped under the four principal headings of the return, and set against an average of four years, exhibits the following:—

	1913-14.	1912-13.	1911-12.	Average of four years.
	Acres.	Acres.	Acres.	Acres.
Tilled lands	264,656	267,276	280,286	270,058
Guinea grass	153,718	152,527	143,592	144,144
Commons	521,754	502,830	517,830	507,242
Wood & ruinate	1,730,120	1,222,699	1,230,001	1,232,024
Total	2,113,248	2,145,332	2,171,709	2,153,468

As compared with 1911-12 the tilled lands show a decrease of 13,010, acres in 1912-13 and 2,620 in 1913-14, and the commons and Guinea grass net increases of 3,924 and 9,126 acres, respectively. Thus the droughts have resulted in a restriction of cultivation and an increase of grazing. A classification of the tilled lands as far as possible under description of cultivation shows the crops and areas for 1913-14 were as follows: sugar-cane, 31,160 acres; coffee, 20,023 acres; coco-nuts, 19,995; bananas, 85,468; cacao, 10,849; ground provisions, 61,834; mixed cultivation, 31,238; minor items, 4,129. Compared with those for 1911-12 and with an average of four years (which are given in the report,) the figures show that the cultivation of bananas, coco-nuts and minor items is increasing at the expense of all other staples, and that the peasantry are rapidly abandoning the production of native foodstuffs. The general increase in tilled lands within the past forty years is said to have been very considerable, having risen from 123,428 acres in 1873-74 to 264,656 in 1913-14; while the pastoral industry has also made some progress, the number of acres in Guinea grass having increased from 119,642 to 153,718, and in commons from 312,693 to 521,754 in the same period. The result of this excess of industry on the part of the inhabitants is that the exports have increased practically 100 per cent.

The work of plant sanitation is stated to have progressed during the year, and the appointment of a special field officer to carry out the treatment of diseased bananas and coco-nuts under the Diseases of Plants Law enabled the Department of Agriculture to maintain a close supervision of the areas where disease had been found. The Panama disease of bananas has been controlled by the drastic measures which were carried out by the Department, and only a few sporadic cases are reported to have occurred during the year on the original sites where it was first discovered in January 1912. An outbreak of the disease however, occurred in an isolated field in Hanover and was dealt with during the year. Speaking generally, the Colony it is added may be congratulated on the health and promise of its banana fields at the present moment.

It is recorded that the work of plant distribution has recently been enlarged by the establishment of local nurseries in Portland, St. Thomas, Clarendon, and St. James, under the direction of the Agricultural Instructors of the Jamaica Agricultural Society.

The Rearing of Poultry on Coco-nut Estates.—An interesting article in *Tropical Life* for March 1915 advocates the rearing of poultry on coco-nut estates. The bulk of these being near the sea, are said to offer four distinct advantages as centres for the rearing of poultry, namely, the means they offer to give the birds the class of goods they require: (1) green food; (2) animal food; (3) grain, i.e., maize as well as poonac; (4) grit and shell. The grass around as well as some green-meat planted, tannias, eddoes, etc., yield the first class, whilst insects more numerous than desirous, together with any animals that it is not desirable to eat, give the second; class three speaks for itself, and class four can generally be secured at an insignificant cost from several points around, especially if there is white coral in the soil.

Poultry, especially in the Tropics, need shelters to protect them from rain, sun and wind, also as a receptacle in which to lay. These, it is suggested, could easily be provided by the use of wire netting fastened from tree to tree, and could be moved from one plot of ground to another as often as is necessary, to allow the land to be ploughed up as soon as the birds have been removed—firstly to conserve their droppings, and secondly to enable a green cover crop to be planted before the birds are brought back. Emphasis is laid on the undesirability of placing shelters very far afield from the house of the keeper. If lots of 5 acres were utilized at a time, that is supposing a wire fencing is used, this by means of the coco-nut palms could be partitioned off into ten or twenty lots of $\frac{1}{2}$ or $\frac{1}{4}$-acre each, as desired. The quantity of manure dropped by poultry is quite a valuable item. The Board of Agriculture leaflet (quoted in the article) calculates the total output of moist manure per 100 birds in twelve months and values it at 1*s.* 1*d.* per bird per year, whilst the *Journal of Agriculture*, Victoria, Australia (November 10, 1914) estimates that 190 birds would deposit 1 ton of manure annually. It would be interesting, therefore, to compare the value per bird with the value per tree on a coco-nut estate.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The main idea put forward in the editorial in this issue is the need for greater investigation of the plant above ground in relation to its environment with a view to increasing the plant's efficiency as a builder up of food material.

Under Fruit and Fruit Trees on pages 148 and 149 are two articles, one dealing with the handling and transportation of citrus fruit and pine-apples; the second dealing with the selection of coco-nuts for planting.

Items of interest concerning cotton will be found on page 150 in this issue.

Insect Notes, which appear on page 154, deal with a method of fumigating seed, an account of pea and bean weevils, and a note on the cassava stem borer. A note also appears on the sweet potato weevil on page 153.

Abnormal Rainfall during April.

After the severe drought experienced in March, the weather in April underwent a sudden change and in most of the islands very heavy rains fell.

In St. Kitts 10 inches were recorded in twenty-four hours, and in one parish in Barbados 12 inches were reported to have fallen in a similar time.

The average April rainfall at the Office of the Imperial Department of Agriculture in Barbados for the five-year period 1910-14 is 1·26 inches. The record for April 1915 is 5·89 or over 4½ inches above the average.

Considerable difficulty was experienced in regard to the shipment of cargo, owing to the heavy rain and the rough seas to the 'leeward' of the islands occasioned by the southernly winds.

The weather, as might be expected, was extremely hot for the time of year and south winds were prevalent for several weeks. In some of the islands the weather has been harmful to the sugar crop, interfering with the harvesting and grinding of the crop. The past month is one of the few if not in many islands the only wet April on record.

It is possible that this unseasonable weather may be indicative of abnormalities in the coming hurricane months.

Report on the Antigua Agricultural and Commercial Society, 1914.

A Report on the work of the Antigua Agricultural and Commercial Society for the year 1914 is published in the Antigua *Sun* for March 18, 1915. From this the following particulars of interest are gathered. During the year fifteen general meetings and thirteen committee meetings were held, the average attendance at the general meetings numbering 22, and no meeting has been dropped for want of a quorum. At these meetings papers on matters affecting the agricultural industries of the Colony were read and discussed, among them being 'Boll dropping of Cotton', by Dr. Tempany and Mr. Jackson, 'Areas under different varieties of Cane in Antigua', also by Dr. Tempany, and 'Vegetable growing for Northern Markets', by Mr. Jackson.

The erection of an establishment for the kiln-drying of Indian corn is recorded, and mention made of the efforts of His Excellency the Governor and the Imperial Department of Agriculture to show that this industry can be made a commercial success. Reference is also made to the special efforts of Dr. Tempany and Mr. Jackson in the work of the Antigua Onion Growers' Association; also to the keen interest which His Excellency takes in the Society, as is evidenced by his attendance at the Society's meetings. The Government and the Agricultural Department find the Society a useful body, and 'the Society's meetings are common ground where Government, Agricultural Department, and members meet together and discuss matters for the good of the community at large—always with freedom—always with good temper.'

The report regrets the loss of Mr. V. M. Weil, the late Secretary, who rendered valuable services and carried away with him the best wishes of members of the Society. Mr. Weil was succeeded as Honorary Secretary by Mr. T. Jackson.

This, it might be added, is the first report of its kind that has been presented to the Society, whose record for past years has been one of good work done for the benefit of Antigua. It is hoped that this work will continue to progress.

Yearly Rainfall in Antigua.

An interesting list of meteorological statistics has been received from Dr. Tempany showing the average rainfall between 1874 and 1914. The average rainfall was least in 1875 when 28·78 inches were received, and greatest in 1889 when 73·59 inches were recorded. These figures are not strictly comparable because the number of stations at which the rainfall was measured has gradually increased. The average rainfall for the past forty-one years is 44·25 inches. The rainfall for 1914 (recorded at seventy-two stations) was 36·86, which is therefore 7·39 inches below the average. In regard to the return of rainfall at the different stations for each month during 1914, the interesting fact to be noticed is that the precipitation at the Botanic Station is approximately the average for the whole island.

By-law for the Sale of Milk in Antigua.

This by-law (No. 4 of 1914) marks an important advance in attempts to control the purity of milk supply in the Leeward Islands. Although the provisions are open to criticism from a chemical standpoint, it would appear that the regulations will prove suitable for ameliorating the conditions obtaining in St. John's. Briefly the by-law lays down that every vendor must have a license, that every huckster must wear a metal badge, and that no person shall receive a milk vendor's license unless the Commissioners are satisfied that the milk is obtained under sanitary conditions, and that the cows are free from tuberculosis and other dangerous diseases. Every licensed holder is required to notify the Commissioners of the existence of any disease among his cows, and no person suffering from a communicable disease shall be permitted to handle milk. Any person who shall sell any impure, unwholesome, or adulterated milk shall be guilty of an offence against this by-law. The terms impure, unwholesome or adulterated are used to mean milk containing less than 3 per cent. of fat and 11·5 per cent. of total solids, milk in any state of putrefaction, or having any abnormal colour or smell, milk drawn from cows within twenty days before or ten days after partuition, or milk from any diseased cow or milk produced under insanitary conditions. It is provided that milk must be delivered in locked cans and must not be kept in sleeping apartments.

The Sweet Potato Weevil.

Since the publication of the recent note in the *Agricultural News* for April 24, 1915 (Vol. XIV, No. 339, p. 138), Bulletin No. 192 of the United States Department of Agriculture has been received, and this contains reference to another locality for the occurrence of the sweet potato weevil (*Cylas formicarius*).

The title of the bulletin referred to is Insects Affecting Vegetable Crops in Porto Rico, and in this the record is given of the occurrence of the sweet potato weevil as a pest of the sweet potato in that island. This brings the known habitat of this insect much nearer to the islands of the Lesser Antilles and emphasizes the necessity for every precaution to be taken against the introduction of the sweet potato weevil into the islands where it does not yet occur.

Tonka Beans in Trinidad.

The *Port-of-Spain Gazette* for April 17, 1915 contains the information that there is a Tonka bean plantation comprising some thousands of trees at Maracas in Trinidad. The trees which are now in bearing yielded last year 500 lb. of beans which were sold locally at $1·00 per lb. It is reported that orders are being sent to this estate for seeds for planting purposes. The *Gazette* considers that this cultivation should prove a most valuable minor industry.

Information concerning the Tonka bean has been given in the *Agricultural News* in Vol. XI, p. 149, in Vol. IX, p. 149, and in Vol. V, p. 212. These references describe the cultivation and collection and preparation of the beans, their uses in commerce, and the extent of their production. The Tonka bean is the dried seed of the fruit of the leguminous tree known as *Dipterix odorata*, which is indigenous to the forests of the northern part of South America. The tree attains a height of 80 feet and the seeds are described as possessing the sweet odour of new-mown hay. In fact it is the odoriferous quality of these beans which gives them their commercial value. The Tonka bean is employed not only by makers of perfume and flavours, but also by manufacturers of tobacco and snuff, especially in the United States.

Official Guide to the Botanic Gardens, Dominica.

This interesting handbook has just been published by the Government of Dominica and edited at the Imperial Department of Agriculture. It gives an account of the more interesting plants met with in following an itinerary around the Gardens, and the text, which contains notes regarding the economic characteristics of the plants, is illustrated with photographs. A useful feature of the publication is the plan of the grounds on which can be seen the relative areas reserved for different purposes. Another feature of value is the section describing the experiment plots. This will give the visitor an intelligent idea of one of the ways in which this botanical establishment benefits the planter. The handbook is provided with an exhaustive index containing references to the principal plants.

INSECT NOTES.

A METHOD OF FUMIGATING SEED.

What appears to be a new departure in the practice of fumigating seed for the destruction of insects which might be in or on them, is described in Bulletin of the U. S. Department of Agriculture, No. 186, issued February 27, 1915.

The authors state that a perfectly reliable method of destroying insects present in seeds imported into this country [United States] is much needed. The exclusion of insects by a careful selection of apparently uninfested seeds at the port of export is impracticable, because many injurious insects pass their larval and pupal stages and a portion of the adult stage enclosed within the seed, and on this account might easily escape notice when the seeds were inspected. Furthermore, seeds are frequently received from localities where injurious insects are not well recognized, and also, insects which are only slightly injurious in their native habitats occasionally become destructive pests when established in this country.

The ordinary methods of destroying insects in stored seeds, such as subjecting them to heat (with or without moisture), carbon bisulphide, and hydrocyanic acid in the presence of air, have been tried and found unsatisfactory for this purpose.

The experiments recorded in Bulletin 186 were trials of fumigating with hydrocyanic acid gas in a close chamber from which the air had been exhausted. The fumigation chamber used in these experiments consisted of an iron tubing, 36 inches long and 12 inches in diameter. The air was exhausted by an air pump driven by a motor. Arrangements were made so that after seeds were in place and the air sufficiently exhausted, the necessary amount of dilute acid could be introduced to act on the cyanide which had been placed in position before the chamber was closed. By this contrivance the poisonous gas was generated within the tightly closed chamber, and its penetration was much greater than as ordinarily used.

It is stated in the summary of these trials that fumigation by the method described in this bulletin was found to kill insects without injury to the seed and with a considerably shorter exposure than is necessary in the usual method of seed fumigation.

PEA AND BEAN WEEVILS.

Attention has been directed in the West Indies and other parts of the British Empire to the necessity for the cultivation of minor food crops, among which are peas and beans, as one of the consequences of the upset in agricultural conditions resulting from the great European war.

The increase in the areas devoted to the cultivation of these crops will naturally result in an increase of the pests which attack them, and this latter may be for the first season or two out of proportion to the former.

Peas and beans are attacked by leaf-eating caterpillars, by borers in the tips of the shoots, and by the group of weevils which are most conspicuous as a result of the injury they do to stored seeds. Specimens recently received from the Curator of the Botanic Gardens, Montserrat, with the statement that they were causing serious injury to the seeds of pigeon peas, serve to call attention to these insects in connexion with the development of the pea and bean crops.

The specimens referred to are identified as the cowpea weevil (*Bruchus chinensis*). This is distinguished from some of the nearly related forms by the two bright, ivory-white oval spots at the base of the thorax, and by the deeply pecinate antennae of the scale. These characters are shown in the accompanying figure. There are several species of Bruchus which attack peas and beans, and although they may have preferences as to the species of bean or pea which they infest, they probably all attack the different kinds of these plants, and they have been even reported as attacking seeds of other kinds.

FIG. 6. THE COWPEA WEEVIL. ENLARGED. (*From U. S. Dept. Agriculture.*)

The insects of the genus Bruchus, the pea and bean weevils, are not weevils in the sense of being members of the Rhynchophora, the snout beetles, in which the front of the head is prolonged into a definite beak, as for instance the sweet potato weevil and the cassava stem borer. They probably got their name because of the weevily effect they produce in the stored seed.

The usual manner of attack of these insects is this. The eggs are laid in the flower or on the very young pod on the plant. The grub on hatching bores into the young seed, where it develops and changes to pupa and adult. The attacks of these insects render the seeds unfit for food or for planting.

The remedy to be adopted against the pea and bean weevils consists of planting only seed which is free from weevils, and in destroying the insects in the stored seed and keeping it free from them.

When peas or beans are harvested they should be fumigated with carbon bisulphide and stored with naphthalene. Fumigation with carbon bisulphide is accomplished by placing the seed in a tight receptacle, such as a box, barrel or tin, and placing a small quantity of carbon bisulphide in a shallow dish. After several hours, the receptacle may be opened and the seed aired and further dried if necessary.

In storing, naphthalene enclosed in small muslin bags should be placed among the seed. One pound of naphthalene in $\frac{1}{4}$-lb. lots should be sufficient to give protection to about 40 bushels of grain.

Directions for the use of carbon bisulphide will be found in Pamphlet No. 71, Insect Pests of the Lesser Antilles, p. 158, and on reference to the *Agricultural News*, Vol. XIII, p. 360 (November 7, 1914), an account of the use of naphthalene for the protection of stored grain will be found.

The leaf-eating caterpillars, of which the bean leaf-roller (*Eudamus proteus*) and the Woolly pyrol moth (*Thermesia gemmatalis*) will probably prove the most abundant, are likely to become troublesome. In the past they have generally been controlled by their natural enemies except for local outbreaks, and this condition may be expected to prevail again after possibly one or two seasons in which a fairly uniform area of leguminous crops is cultivated in each locality. Trials have been made recently with Paris green and arsenate of lead in order to observe the effect of these insecticides on the foliage of bean plants of several kinds. It was found that Paris green, in mixture with lime or flour always seriously injured the leaves, whilst dry arsenate of lead applied as a dust, either by itself or mixed in various proportions with flour or lime, caused very little injury to the leaves, and, so far as trials have been made, this appears to be the correct insecticide to use against these insects.

CASSAVA STEM BORER.

Specimens of an insect attacking the stem of cassava plants in St. Vincent were recently received at the Office of the Imperial Department of Agriculture.

Cassava growing at the Experiment Station was rather seriously attacked and a considerable amount of injury resulted. The insect has been identified as a species of Cryptorhynchus, a genus which is credited with an unusual number of species in the West Indies and the American tropics. The most common and abundant Cryptorhynchus is probably the Scarabee or Jacobs of the sweet potato, *C. batatae*. Another form is *C. corticalis*, which is known as a borer in ornamental crotons in St. Vincent and Grenada, while another species sometimes causes injury by boring in the wood of orange and similar trees. This insect is shown in Fig. 7, which serves to illustrate the general appearance of these insects.

Fig. 7. The Orange Borer.

Fig. 8. Pupa of Scarabee. Enlarged.

The cassava stem borer is larger than the scarabee, the adult being $\frac{1}{4}$-inch, the pupa $\frac{3}{8}$-inch, and the full-grown larva about $\frac{1}{2}$-inch in length. The pupa very much resembles that of the scarabee which is shown in the accompanying Fig.

The cassava stem borer is so little known that there has been no opportunity of testing methods that may be used for its control. It is suggested, however, that all material for planting should be quite free from infestation, and, in fact, that no plant material should be taken from any field known to be or suspected of being infested by this insect, and all bits of stem in infested fields should be carefully removed from the fields and either burned or deeply buried in order to kill the grubs and beetles in them.

H.A.B.

Revival of the Beche-de-Mer Industry in the Bahamas.—Recently a shipment of bêche-de-mer, valued at about £8,000, was made to Chinese ports from the Bahamas, which revives an industry that for a period of forty years promised well. The sea slugs in the waters of the Bahamas appear to be of high quality as compared with those of the East Indies and Australian coast and the atolls of Polynesia. In the south-western section of the Pacific the industry is valued at more than £2,500,000 annually, but the supply seems to be getting limited. It is said to be likely that, with proper selection with reference to size, colour, and correct method of curing, and the facility for shipment through the Panama Canal, the Bahamas may in the near future benefit from an increased demand for this article. Even in Paris bêche-de-mer is served at many restaurants, although the greatest quantity is required for the people of China. (*Journal of the Royal Society of Arts*, March 19, 1915.)

OUTLOOK FOR CASTOR OIL SEED CULTIVATION IN THE WEST INDIES.

An enquiry concerning the cultivation of the castor plant, recently received at this Office, includes a statement to the effect that an acre under this crop will yield £14 net. The facts relating to castor cultivation show this estimate to be high, and it may be of interest to consider them.

The time which the castor crop takes to come into bearing varies with the variety and the climatic conditions under which it is grown; the fruits may be gathered in four months, but it may be seven months or even longer. With 1,210 plants per acre (planted 6 feet by 6 feet,) the yield may be expected to be under ordinary circumstances about 1,000 lb. Assuming that two crops could be produced annually, the yield would be approximately 2,000 lb. The price of castor seed at Liverpool in May 1912 was £12 per ton, (it apparently varies from £9 to £13,) so that the gross revenue from an acre each year would be £10 15*s*. Subtracting the cost of cultivation and transportation, which would amount to at least £4, we arrive at an estimate of £6 15*s*., which is less than half that which has been quoted above. Even £6 15*s*. is probably too high since, as already intimated, it is not possible to rely upon two crops each year (because of climatic conditions), and certainly unwise to expect the maintenance of the English market price at a normal level like £12 per ton.

The castor plant makes an exhausting crop and can only be grown commercially on good soil. The oil is usually expressed abroad, but if done locally the residual cake, being unsuitable as a foodstuff, makes a useful manure. The most likely way of growing castor seed profitably in the West Indies is as a catch crop on well manured land, or as is done in India, growing it around cotton or sugar-cane fields, or with potatoes, cereals or a leguminous crop.

It may be added that experiments with castor oil have been conducted at several of the Botanic Stations in the West Indies, especially at Antigua during 1908-10. Here two $\frac{1}{10}$-acre plots were planted 5 feet × 4 feet on February 17. Each plot contained two varieties, that is, $\frac{1}{20}$-acre was planted in each variety. The seeds were harvested on November 1. Hence the crop was in the ground nine and a half months.

The yields were as follows:—

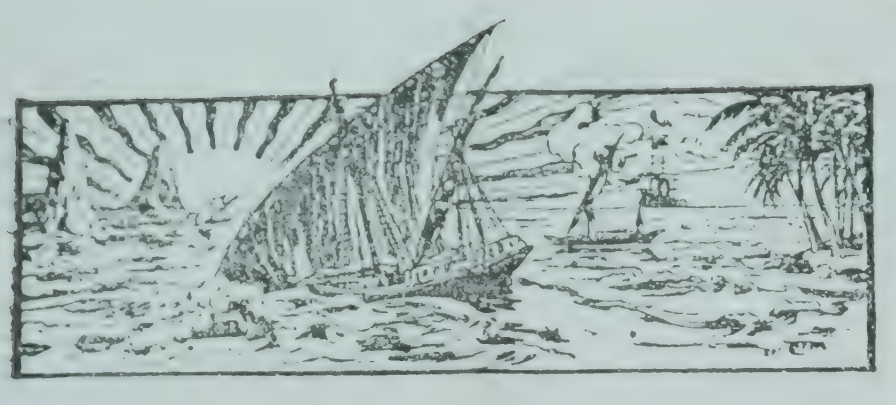
Ricinus No.	3,173, 65 lb.	shelled seed or	1,300 lb. per acre
,, ,,	3,172, 61 ,,	,, ,,	1,220 ,, ,,
,, ,,	3,176, 48 ,,	,, ,,	960 ,, ,,
,, *Zanzibariensis*,	42 ,,	,, ,,	840 ,, ,,

The crop is not grown in Antigua or any one of the Leeward Islands except to a limited extend as a green dressing, and an extension under ordinary circumstances is not to be expected.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on May 5, 1915, by the S.S. 'Guiana' with the object of paying an official visit to St. Kitts and Dominica in connexion with agricultural administration. The Commissioner is expected to return to Barbados by the S.S. 'Guiana' arriving on or about June 10.

Mr. W. Nowell, D.I.C., Mycologist to the Imperial Department of Agriculture, is expected to leave Barbados on May 19, by the C.R.M.S. 'Chaudiere' with the object of paying a visit to Dominica in connexion with plant diseases.



GLEANINGS.

It may be of interest to point out that the well-known tree of Grenada called locally the Tanti cayou (or Dandy cayou) is *Piptadena perigrina*. This tree is useful as a shade plant, and as a source of firewood.

Vaccination of pigs against cholera forms the subject of a useful Circular (No. 54) issued by the Agricultural Experiment Station of the University of Wisconsin. A table at the end, giving a summary of the results, shows that a percentage of recoveries is effected amounting to 91·6 per cent.

From an article which appears in the *Journal of the Board of Agriculture* for February 1915, dealing with the economic side of sugar beet production in Norfolk and Suffolk, it is clearly indicated that farmers whose land is adapted for beet have successfully grown this crop for the Cantley Factory in Norfolk.

During 1913-14 the Grenada Land Settlement Scheme continued to make good progress. During this period the blocks of land at Calivigny, Morne Rouge North, and Morne Rouge South were added and offered for settlement. A table shows that satisfactory progress has been made in regard to their sale to the small holders.

It is stated in the St. Vincent *Government Gazette* for February 18, 1915, that by authority of the Agricultural Credit Society's Ordinance, 1913, a new agricultural credit society has been duly registered as required by the provisions of the Ordinance. This Society is known as the Barrouallie Agricultural Credit Society.

Information has been received that Mr. A. H. Ritchie has been appointed to the post of Entomologist, Department of Agriculture, Jamaica. Mr. Ritchie, who has studied at Edinburgh University as well as at the New York State Agricultural College, has spent the last eighteen months travelling on a scholarship from the Imperial Bureau of Entomology at London.

Interesting facts regarding the sugar industry of Barbados is contained in *Colonial Reports*, Annual, No. 824 of 1913-14. During the period 1910-13 inclusive, the sugar crop amounted to the following (in tons of sugar): 52,300, 47,610, 44,817, and 31,329. Mention is made of the new variety B.6450, the drought-resisting qualities of which were referred to in the previous year's report. This cane continues to give good results.

A copy has been received of a Handbook containing a list of the herbaceous plants and under shrubs of the Gold Coast, which forms a companion volume to the 'List of trees, shrubs and climbers' noticed in the *Agricultural News* last year. The enumeration represents only a very small proportion of the whole flora, but collectors are constantly bringing to light new material which will form a basis for future systematic work.

As a result of the recent vaccinatory measures undertaken by the Government of British Guiana on the East Coast of that Colony, upwards of 700 animals have been treated against anthrax during the past three weeks, and it is stated in the Demerara *Daily Argosy* (March 20, 1915) that not a single instance of death has resulted therefrom. Through the courtesy of the Govenments of Trinidad and St. Vincent, a supply of vaccine was obtained pending the arrival of the supply ordered by the Board from England.

An estimate of the yield of crops in the United States during 1914 appears in *The Board of Trade Journal* for February 11, 1915. In regard to maize, it is stated that this crop was not so extensively cultivated as in the two preceding years, and this is reflected in the decreased production of 2,672,804,000 bushels, which is only a moderate crop. Notwithstanding this, however, the high prices prevailing have made it the most valuable maize crop ever produced in the United States. This information is of interest in connexion with the extending area under Indian corn in the West Indies.

In countries like Australia, which possess limited resources as regards iron but large timber resources, the idea of using wood piping as the substitute for metal piping has gained much support. The catalogue of the Australian Wood Pipe Co., Ltd., contains a very complete account of the subject, and is illustrated with a large number of photographs showing the pipes being used for different purposes, the principal one being for water-supply. It is pointed out that wood piping has many advantages over iron piping: the initial cost of the material is less, durability is greater (since wood saturated with water is indestructible), and there is little trouble in regard to the effect of frost.

The present shortage in England of synthetic yellow dyes has been temporarily met by the increased use of fustic, a natural yellow dye stuff in the wood of a tree (*Chlorochora tinctoria*) which grows freely in Jamaica and also in British Honduras. The increased demand has greatly raised the price of fustic. Only a moderate amount of cut fustic wood was, as it happened, available when the demand first increased after the outbreak of war, but as a result of the action of the Imperial Institute, the Government of Jamaica have offered to purchase from the growers further supplies and carry these at Government cost to Kingston, the port of shipment. Negotations are accordingly now pending for the purchase and shipment of considerable quantities of Jamaica fustic by dyers in England. The Government of British Honduras is also taking action in this matter, and a further supply of the wood may possibly be forthcoming from that Colony.

Manurial Experiments with Indian Corn in Nevis.—The report of the Agricultural Instructor, Nevis, for the quarter ended March 31, 1915, states: The cotton demonstration plot was laid out as manurial experimental plots for Indian corn. Each plot was $\frac{1}{5}$-acre in size and numbered from 1 to 4, and the experiment carried out in duplicate. The plots were planted late in December and the following manures applied early in January :—

Plot 1	No manure
Plot 2	Pen manure (5 small cart loads)
Plot 3	Basic slag (40 lb.)
	Sulphate of potash (20 lb.)
	Sulphate of ammonia (30 lb.)
Plot 4	Cotton-seed meal (90 lb.)

During the month of January the weather was very favourable and the plants made rapid progress in growth, but in February the weather became very dry, and much worse in March. The plants suffered very much and the crop was somewhat prematured. The crop was reaped on March 22, and the average returns were as follows:—

Plot 1	528 lb. of corn on the cob.
Plot 2	545 lb. „ „ „ „ „
Plot 3	598 lb. „ „ „ „ „
Plot 4	590 lb. „ „ „ „ „

The above figures indicate that no net financial gain accrued from the manuring. It has to be remembered however, especially in the case of the pen manure and cotton-seed meal, that there is a large residual effect which may show itself in subsequent crops. Furthermore the dry weather prevented, no doubt, the full effect of the artificial manures being shown.

The Tohoku College of Agriculture.—Incorporated with the Tohoku Imperial University of Japan is a college of agriculture of considerable size. The institution is described in a publication issued by the college and recently received at this Office. It is stated in the historical summary that the college consists of four departments—agriculture, agricultural chemistry, forestry, and zootechny, and it is interesting to add that the institution has grown out of the old Sappora Agricultural College, established in 1876 by General Count Kuroda, the far-sighted colonial Governor of Hokkaido. Since that time the college has become affiliated to the University and has made great improvement in its curriculum and has added many new buildings. As well many acres of land have been set aside for scientific investigation and experiment. The farms alone cover an area of 14,950 acres, and nearly 200,000 acres are reserved for the study of forestry. From this it will be seen that the institution is a very large one. The course of agriculture covers a period of three years, and in this connexion it is of interest to note that the average age of the students in each year, respectively, is twenty-two and a half, twenty-four and a half, and twenty-six—rather high in comparison with those for English colleges. The illustrations in the publication under consideration show that the college is provided with excellent laboratories, a large museum, and a special building is devoted to the study of economics, whilst large buildings are provided for breeding experiments, dairy work, and veterinary operations. Altogether it would seem that this institution is a model one of its kind, and, as publications show from time to time, is gradually achieving its ideal of turning out fresh knowledge, not only of local but also of international importance.

Thrips on Cacao Trees.—A small pamphlet having this title has recently been prepared by Mr. J. C. Moore, Superintendent of Agriculture, Grenada, and published by the Board of Agriculture of that Colony. In this publication it is pointed out that thrips cause injury by feeding on the tender tissues of the leaves and pods. It is stated that the infestation of trees by thrips is frequently correlated with unhealthy surroundings, such as unfavourable conditions of soil and climate, or to a natural want of vigour in the trees themselves .It is therefore recommended that attention should be given to the production of a healthy environment by means of proper drainage, supply of organic matter to the soil, and the provision of shelter. Attention is called to the fact that young thrips on pods may complete their development on the empty shells, and when mature may fly away to infest other pods and leaves. Instead of allowing the shells to remain scattered or in heaps about the field, they should be buried, burnt, or covered with lime.

Several preparations are described for spraying. These include resin wash, resin compound, kerosene emulsion, resin and whale-oil soap compound, whale-oil soap and Scalo.

It may be added that further information in regard to thrips on cacao will appear in a succeeding issue of the *Agricultural News*, under Insect Notes.

The Timber Resources of Cuba.—The forest areas of the island are mainly in the Santiago district, and although during the last decade immense areas have been cleared for cultivation, it is estimated that about one-seventh of the cultivable area of Camaguey and Oriente Provinces yet remains in primeval forests. While undoubtedly there still exists in the Cuban forests much valuable timber, they have been depleted to a great extent of those valuable woods for which there is a demand in foreign markets, especially cedar and mahogany. The Government exercises control over the forests, whether of public or private ownership, and no timber can be cut for any purpose without a permit being obtained from the chief of the Bureau of Forestry of the district in which the timber is situated. Notwithstanding the stringent laws and regulations adopted to prevent the cutting of timber on lands by persons who have no right thereto, the forests on lands belonging to the State have been robbed and in a great measure stripped of their most valuable products. Much of the land classified as forest or timber land has long since been stripped of all timber of marketable value, and at the present rate, with no effort at renewal, it will not be long until no merchantable timber will be found in the island. (*Journal of the Royal Society of Arts*, March 5, 1915.)

The Board of Trade Journal for February 18, 1915, contains notes of interest in connexion with the demand for tropical products. A firm in New Zealand wishes to get into touch with manufacturers of soft and hard coco-nut butter suitable for biscuit makers and confectioners; a Nova Scotia firm is making a demand for palm kernels; while a note concerning the demand for lemons in Russia is of some significance in relation to the supply from Sicily during the war. The commercial campaign conducted by the English Board of Trade is likely to result in an extension of the consumption in different parts of the world of the tropical products of the British Empire.

FOOD CROPS.

THE CULTIVATION OF LIMA BEANS.

In connexion with the Circular recently issued by this Department urging an extension of the area under Lima beans, the information to be found on pages 22 and 23 of the Botanic Station Report, Antigua, 1909-10, is likely to be of interest. The information referred to deals with trials made with two forms of this bean—the Lima bean and the Barbuda bean—both being varieties of the species *Phaseolus lunatus*.

The first point which received attention was the amount of moisture contained in these two plants, and it was found that the loss after drying in air was for the Barbuda bean, 73·5 per cent., and for the Lima bean 73·5 per cent. This will be seen to compare favourably with Woolly pyrol (*Phaseolus Mungo*) which lost as much as 76·3 per cent. In other words, the beans belonging to the species *lunatus* contain more dry matter than that belonging to the species *Mungo*. The value of *Phaseolus lunatus* as a green dressing is therefore greater in this respect.

Measurements were made of the main roots of these plants with a view to finding out from what layer of soil their food supplies are obtained. Sixty-six days after planting, the root of the Barbuda bean measured 16 inches, that of the Lima bean 13 inches, and that of the Wooly pyrol 11½ inches. This tends to show that the first two varieties are more deep rooting than Woolly pyrol.

At the time when these experiments were made, the number of acres of estate land cultivated in Barbuda bean (as a green dressing) was 112, while that under Woolly pyrol was 42, and that under Lima bean was *nil*.

Some interesting figures are given in the report under consideration, of the weights of different green dressings grown at Skerretts and other experiment plots. Lima bean planted on August 4 and reaped on October 8 gave 138 lb. of green bush from $\frac{1}{40}$-acre, which is equivalent to 5,520 lb. per acre. The Barbuda bean ($\frac{1}{40}$-acre) planted and reaped on the same dates, yielded 206 lb., equivalent to 8,480 lb. per acre. A similar area of Woolly pyrol planted and reaped on the same dates gave 74 lb., equivalent to 2,960 lb. per acre. These figures show the great value of the Barbuda bean as a green dressing, and help to explain its popularity amongst Antinguan planters.

The above information refers entirely to the value of the genus Phaseolus as green dressings. It will be remembered that the present policy involves the cultivation of these plants not merely as soil improvers but as food crops and grown on a field scale. Curiously attention was given to Lima beans from this point of view as early as 1903, and in the Antigua Report for that year there are figures to show the yields obtained under experimental conditions. A plot was established on June 2, 1903, and the beans were planted 18 inches apart in beds 4 feet wide. The growth was good and very little insect attack was experienced. The yield of shelled beans was 100 lb. As the planting was much too wide, a second crop was put in, two rows at 1 foot apart on each bank; the yield of this planting is not recorded.

Bush Lima beans were also sown on October 16, 1903, after Indian corn, on plot 22 at 1 foot apart, two rows on a bank. The growth was good, and the beans were harvested on January 7, 1904. The yield obtained was 44 lb. of shelled beans. The area of each plot was $\frac{1}{160}$-acre.

INTERESTING BEANS IN AMERICA.

The Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction of the United States Department of Agriculture during October 1 to December 31, 1912, contains several interesting references to species of Stizolobium (Lion bean), Canavalia (Sword and Jack bean), Phaseolus (Adzuki), and Vigna (Asparagus bean). The references to these have been collected together from the above publication and brought under their respective generic headings.

In regard to Stizolobium, a note is made on the presentation of *S. niveum* and *S. pachylobium* by the Botanical Survey of India, and it is stated that all the varieties received have been known in India to have been in cultivation for centuries. Another spieces of Stizolobium, received from the same source, resembled the Florida velvet bean very closely, but it was not suitable for forage owing to the trouble caused by the stinging hairs. Still another species obtained from India, from a different source, was described as an annual of climbing habit, the immature seed pods being borne in clusters and eaten when about 6 inches in length. When cooked they are said to resemble, and to be almost equal to, the French bean. *Stizolobium cenereum* is very similar to the one just described. Speaking of the Stizolobiums as an article of food, the Superintendent of the Government Horticultural Gardens, Lucknow, says: 'regarding the value of the fruits as an article of food, I may say that I have eaten them regularly and appreciate them as I have other similar beans. I have not heard of any bad results from eating the pods. It must be remembered that they are eaten only in the young state, when they are tender and practically free from hair. Before cooking, the outer skin is carefully scraped so as to ensure that no hairs remain. The pod is very succulent and is, so far as I know, wholesome, and may be recommended as an article of diet.'

Turning to the genus Canavalia, it is stated that *C gladiatum* (the Sword bean) may be eaten when the pods are young, and that this is a very useful vegetable because it is obtainable [in India] when other vegetables are scarce. The Jack bean (*Canavalia ensiformis*) also receives attention, and the remarks made by an Hawaiian planter are referred to. It is said that there is no great difficulty in inducing cattle to eat the Jack bean. They certainly seem to prefer the vine to the pods at first, but by judicious mixture with other fodders the cattle can be taught to appreciate both parts of the plant.

An interesting reference is that which has regard to *Phaseolus angularis* (the Adzuki bean) sent to the United States from Cuba. The presenter states: 'last year I found a few plants of what was to me a new bean. The plant is small, 4 to 10 inches tall, with yellow blossoms, but the pods set on more like a cowpea than like a white soy bean of the North. They roast nicely and make a good cereal coffee; also seem to cook as a soup bean except a little slow to soften.' Another writer says: 'these are employed in Japan for human food. The commonest method of eating them is to make a meal from the beans, from which cakes of various kinds are made.'

On another page a note on this bean says that those of the best quality cost about 15c. a quart, smaller beans, of second quality 10c. These prices refer apparently to the Japanese trade.

The last bean of interest in the publication is the Asparagus bean (*Vigna* [dolichos] *sesquipedalis*). This was sent from Cuba and is indeed known as the Cuba or Asparagus bean. It is an annual of climbing habit grown for its long pod, which when immature is served like the French bean. The pods when fully grown are 9 to 12 inches long.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. The Superintendent of Agriculture (Mr. J. C. Moore) in a recent letter informs this Office that the cacao fields throughout the island are in splendid condition for the season, compared with that for the past three years. The crop greatly improved during the month of March and the prospects for a good finish are apparent. Nutmegs were showing a good crop. Routine work in the Botanic Gardens included the clearing up of bush infested with Love Vine on uncultivated land, spraying lime seedlings with 'Scalo' against green scale, and mulching lime beds with leaf sweepings, which has proved very effective in helping the plants through the dry season. The Superintendent states further that he has associated himself to a considerable extent with educational work: 'Notes on the Teaching of Agriculture in the Primary Schools of St. Lucia' has been prepared for the Board of Education; and the Superintendent has, in response to the Governor's wishes, offered to give a course of lectures to teachers next August. In regard to Land Settlement, applications for lots at St. Cyr were received and considered, and selected allottees were soon to be given occupation. Meetings of peasant proprietors were held during the month at which short addresses were delivered by the Agricultural Instructor. The weather during March was very dry with very high winds during the last ten days. The weather during April in this island, as in others, underwent a sudden change and extremely heavy rains were experienced.

The report of the Acting Land Officer, Grenada, for the month of March 1915, states that the improvement of the by-way which passes through the St. Cyr Settlement was carried on during the month. The Land Officer visited a section of the Crown Lands forest and inspected the condition of the boundary lines and the huts. Another visit was paid in company with the Superintendent of Agriculture to the experimental plots of rubber, Ippi-appa, and camphor in the Grand Etang section. An account of the condition of these plots is not included in the report.

ST. VINCENT. The Agricultural Superintendent (Mr. W. N. Sands) reports that the trials with Bermuda onions at the Experiment Station have given useful results. Planting on the flat and on banks showed that far heavier returns can be obtained on the banks. A large order for seed for next season has gone forward. It is stated further that many lots of cotton seed reserved for planting have shown poor germinating power, due no doubt to the bad weather in the picking season. Two lots of seed have been ordered from St. Kitts for a local planter for trial on a large scale.

Work in the Experiment Station and Botanic Gardens has included the inspection of several thousand coco-nuts, the reaping of arrowroot and extraction of starch, and the pruning of seeds and shrubs. In the Gardens, a 30-foot basin was being excavated for aquatic plants. This basin when completed will be the largest of its kind in the smaller islands and will add considerably to the attractiveness of the Gardens, besides providing a permanent breeding place for 'millions' for distribution.

The rainfall during March was very small, in fact the lowest precipitation since the records have been taken by the Department.

ST. LUCIA. Observations relating to the staple cropt in this Colony, forwarded by the Agricultural Superintenden (Mr. A. J. Brooks), show that the condition of the cacao and lime crops were normal and that sugar was being reaped under favourable conditions. During March, Mr. Brooks prepared and submitted the annual report on the examination of elementary schools in agriculture. He also spent nine days at the northern end of the island dealing with general agricultural matters relating to the lime juice factory and the Botanic Gardens. It is stated that the last 3 casks of lime juice were to be shipped by first opportunity, making a total crop for the year of 43 casks as against 6 the previous year.

Work in the Experiment Stations and Gardens has included mulching, weeding, reaping of canes, preparing land for further planting of cane, and the budding of citrus fruits.

The rainfall during the month was very low; at the Botanic Station, Choiseul, it was nil.

NEVIS. Some interesting figures are included in a quarterly report from the Agricultural Instructor (Mr. W. I. Howell) in connexion with the manuring of Indian corn. These results will be found on another page in this or the succeeding issue. As regards cotton, the second growth in many of the fields was damaged by worm; but in other fields chiefly to the windward part of the island, the second picking was very good. Leaf-blister mite was observed to a fairly large extent. At the time of writing the cane crop was almost reaped and the greater part had been sold to the St. Kitts factory. Sugar was made on a few estates and this realized good prices in the local market. The young canes were very promising and the fields had nearly all made a good stand, but in many cases the preparation had been very indifferent.

During the month of March the rainfall was very low, and the crops suffered considerably, especially the more advanced fields. During the quarter, provision crops did fairly well and the limes at Maddens estate have considerably improved as the result of a fairly heavy application of pen manure. Live-stock is stated to be in good condition. The Mysore bull is stated to be in good condition and there are a fair number of young half-bred calves coming on. The Hackney stallion 'Major' is stated to be in very fine order, and is open to service to all mares in the island at a very moderate fee.

Regular visits to the plantations in the different parts of the island were paid by the Agricultural Instructor and advice given as to the work in progress. Mr. Shepherd, the Agricultural Superintendent, and Mr. Waterland, the Assistant Chemist, visited the island towards the latter part of the present quarter.

VIRGIN ISLANDS. The drought experienced during the two previous months continued throughout March, and agricultural operations in the Gardens and experiment plots were seriously hampered. The Acting Curator (Mr. C. A. Gomes) states that the reaping, drying, grading and packing of onions for shipment formed work of some importance. Some 2,000 lb. of onions were reaped and handled at the Experiment Station. The cotton factory ginned and shipped 60 bales of cotton during the month, and 24 barrels of local sugar were produced for the use of the peasantry. A second picking of cotton was not expected owing to unfavourable weather, and a limited number of limes has been received at the factory owing to the same cause. The young coco-nut fields are, however, making fair progress. There has been an extensive planting of corn, and interest in the co-operative side of corn production as well as of onion production was stimulated by a visit from Dr. Tempany.

MARKET REPORTS.

London.—The West India Committee Circular April 6, 1915.

Arrowroot—$2\frac{1}{8}d.$ to $2\frac{9}{16}d.$
Balata—Sheet, 2/2; block, 1/11¼ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 98/- per cwt.; Grenada, 89/- to 96/6; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £26 10*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 18*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, £21; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations
Mace—1/4*d.* to 2/11*d.*
Nutmegs—$4\frac{1}{4}d.$ to $5\frac{3}{4}d.$
Pimento—Quiet.
Rubber—Para, fine hard, 2/5½; fine soft, 2/3¾; Castilloa, 1/7 to 2/-.
Rum—Jamaica, 3/ to 4/

New York.—Messrs. Gillespie Bros., & Co., April 17, 1915.

Cacao—Caracas, 16¾c. to 17¼c.; Grenada, 17¼c. to 17½c.; Trinidad, 17½c. to 18c.; Jamaica, 15½c. to 16¼c.
Coco-nuts—Jamaica and Trinidad, selects $24·00 to $26·00; culls, $14·00 to $16·00.
Coffee—Jamaica, 8¼c. to 12c. per lb.
Ginger—9¾c. to 12c. per lb.
Goat Skins—Jamaica, 43c.; Antigua and Barbados, 41c. to 43c.; St. Thomas and St. Kitts, 40c. to 42c. per lb.
Grape Fruit—Jamaica, $1·20 to $1·75.
Limes.—$7·50 to $8·00.
Mace—48c. to 55c. per lb.
Nutmegs—12c. to 14¼c.
Oranges—Jamaica, $1·25 to $1·50.
Pimento—3¾c. per lb.
Sugar—Centrifugals, 96°, 4·89c.; Muscovados, 89°, 4·45c.; Molasses, 89 , 4·24c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 3, 1915.

Cacao—Venezuelan, no quotations; Trinidad, $19·92 to $20·16.
Coco-nut Oil—75c. per Imperial gallon.
Coffee—Venezuelan, 11c. per lb.
Copra—$4·50 to $4·65 per 100 lb.
Dhal—$7·50.
Onions—$4·00 per 100 lb.
Peas, Split—$12·00 per bag.
Potatoes—English $2·25 to $2·50 per 100 lb.
Rice—Yellow, $6·00 to $6·25; White, $7·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. T. S. Garraway & Co., May 3, 1915.

Arrowroot—$4·00 to $4·50 per 100 lb.
Cacao—$13·00 to $14·31 per 100 lb.
Coco-nuts—$16·00.
Hay—$1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $82·00 per ton.
Molasses—No quotations.
Onions—$5·67 per 190 lb.
Peas, Split—No quotations; Canada, $5·85.
Potatoes—Nova Scotia, $2·75 per 160 lb.
Rice—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, no quotations.

British Guiana.—Messrs. Wieting & Richter, May 1, 1915; Messrs. Sandbach, Parker & Co., April 30, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	$10·00
Balata—Venezuela block	—	—
Demerara sheet	—	—
Cacao—Native	15c. per lb.	16c. per lb.
Cassava—	96c. to $1·20	—
Cassava Starch—	—	—
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	—	16c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	16c. per lb.
Liberian	10c. per lb.	10c. per lb.
Dhal—	—	$8·25 per bag of 168 lb.
Green Dhal	—	—
Eddoes—	$1·44	—
Molasses—Yellow	None	—
Onions—Teneriffe	—	—
Madeira	—	—
Peas—Split	$12·00 to $12·50	$13·00 to $14·00 per bag. (210 lb.)
Marseilles	—	—
Plantains—	16c. to 48c.	—
Potatoes—Nova Scotia	$2·50	$3·00
Lisbon	—	—
Potatoes--Sweet, B'bados	$1·68	—
Rice—Ballam	No quotation	—
Creole	$5·50 to $5·75	$5·50
Tannias—	$2·88	—
Yams—White		—
Buck	$2·64	—
Sugar—Dark crystals	$3·50 to $3·60	$3·50
Yellow	$4·00 to $4·10	$4·00
White	—	—
Molasses	$3·10 to $3·25	—
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	—

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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The Role of Calcium Carbonate.

CALCIUM carbonate—limestone, coral or chalk—is a mineral to which chemists attach the greatest importance as regards the fertility of the soil. It neutralizes acidity; it hastens bacterial activity; it acts to some extent as a plant food; it liberates potash from insoluble silicates; and it has a very decided beneficial effect upon the physical conditions of the soil. This substance, when strongly heated, gives off, as most people know, carbon dioxide, and quicklime or calcium oxide remains. The oxide, which rapidly becomes converted into the hydroxide in the presence of moisture, has an even more marked effect on the soil than the carbonate. This effect is seen principally in regard to its sterilizing action whereby bacterial activity is at first reduced, but later enormously accelerated as the oxide changes into the carbonate. Once in the soil, the hydroxide soon undergoes this change and combines with carbon dioxide and other acid radicles like nitrates and becomes calcium carbonate again, or calcium nitrate as the case may be. Calcium carbonate, the principal calcium salt in the soil, is not readily removed, though since it serves as a weak base against acidity and is itself soluble in water containing carbon dioxide, the store of calcium carbonate is slowly depleted; and where a soil is not naturally rich in this mineral, its artificial application is generally advisable particularly on clay and peaty soils.

The importance of calcium carbonate as evidenced by these considerations based on experiments conducted in temperate countries leads one to ask whether the mineral is adequately employed in the Tropics. It is a matter of common knowledge that the majority of soils in the Tropics are remarkably deficient in lime, and yet their standard of fertility compares favourably with those of temperate countries. Manurial experiments with lime in the Tropics have not given any very striking results, except that in many cases it has been shown that applications of lime do not pay. Locally this has been demonstrated in the Leeward Islands and in British Guiana.* Quite recently in the Federated Malay States† an interesting investigation has been conducted with a view to ascertaining what are the

lime requirements of rubber soils. The American method was adopted whereby a weighed quantity of soil is allowed to remain for a definite time in contact with a very dilute standard solution of lime. The amount not neutralized is then determined, from which the quantity absorbed from the soil is calculated and expressed in tons per acre 1 foot depth. The magnitude of some of the figures obtained, especially for the clay soils, indicated that liming treatment as hitherto advocated is totally inadequate. On one estate, quicklime to the amount of $\frac{1}{4}$-ton per acre only was being applied, whereas the acidity when estimated proved to be equivalent to over 6 tons. To produce even approximate neutrality in such cases by quicklime would be prohibitive on the score of expense, but it would be feasible perhaps if ground limestone were used. Considering that good yields are under the present methods obtained in the Malaya, it would seem that a certain amount of acidity is not harmful, and may indeed be beneficial. To arrive at a decision on this point further experiments are anticipated. More than once the suggestion has been made that many tropical plants—as well as rice—may take up a part of their nitrogen in the form of ammonia. This would in part obviate the necessity of lime being present on account of the absence of nitrification. Whether this explanation is true or not, it is certain that tropical plants as a whole are not as dependent on a large supply of calcium carbonate as are those plants experimented with in temperate countries.

SUGAR INDUSTRY.

WEST INDIAN CANES IN SOUTH AFRICA.

By the time this issue has appeared many of our readers will have noted an article in the *West India Committee Circular*, which was reproduced from the South African *Agricultural News*, dealing with the results of cane seedling trials in Natal. This article, dealing with West Indian canes, contains information of sufficient technical and local interest to warrant publication in this journal also.

The only variety of sugar-cane grown to any large extent at the present time in Natal is the Uba, and although it is not altogether a very satisfactory type from a milling point of view, it meets with great favour by the planters, and is the only one that has hitherto stood successfully the ravages of frost and drought, as well as the various fungoid and animal pests met with in the sub-tropical areas of this Province. Still, it is not reasonable to hope that the Uba will indefinitely continue to be the satisfactory cropper and be as free from disease as it is at the present time. For these reasons the late Natal Government, in co-operation with some of the planters' associations, from time to time introduced from various spurces other varieties which would be most likely to flourish under local conditions.

Of the fourteen varieties of cane given below, the first ten were introduced some twelve years ago, the majority being from the West Indies and Guiana. Several other varieties were also introduced at the same time, but for various reasons they have been discarded. The three Java varieties, Java Nos. 105 and 147 and Cheribon were obtained in March 1909 from Egypt, as representing the best types of cane grown in that country. The Indian cane (Agaul, from Sultanpur) is only one variety out of nine supplied in 1911 by the Inspector-General of Agriculture in India, the remaining eight having made but poor growth.

The results obtained in connexion with the plant canes in the variety plots are given in the table on the next page.

The following detailed information supplied by the Farm Manager at Winkel Spruit, with regard to the different varieties of cane, will be of interest:—

1. Antigua B. 15.—A healthy-looking cane of rather drooping habit, liable to attack from cane borers, the percentage loss of crop from this cause being about 2 per cent. It has given only a moderate crop, stools badly, and is hardly likely to prove of economic value in Natal.

2. Demerara D. 74.—This cane gives a moderately good yield, and is less liable to the attack of the cane borers than some of the other Demerara varieties. It still maintains its superiority over most of the other types, but the percentage of sucrose in the juice is, however, lower than in any of the other Demerara canes tested.

3. Demerara D. 95.—Gave a very low yield of cane, but probably this was largely due to unfavourable soil conditions. The canes were short in length and produced rather short internodes. It showed a great tendency to form adventitious roots and incipient shoots. The cane was attacked by the borer, the loss being about 5 per cent. It does not stool well, and on the whole is an unsatisfactory variety.

4. Demerara D. 109.—This is a satisfactory cane, stools moderately well, and gave a good yield.

5. Demerara D. 145.—Gave only a moderate crop, and does not stool satisfactorily. Very unsatisfactory also in yield and richness of juice.

6. Demerara D. 625.—This cane is exceptionally stout and upright with long internodes, but was unfortunately attacked by borer, the loss amounting approximately to 10 per cent. It is the heaviest cropper of all varieties tested and yields a good percentage of juice of fairly high density. It is worthy of trial on a more extensive scale.

7. Queensland No. 2.—A stout cane producing rather poor stools and with low percentage of juice.

8. Queensland No. 3.—A thin cane, but with better stools than No. 2. Both the Queensland canes may be* classed as moderate in qualities of growth or production.

9. Honolulu Rose Bamboo.—A thin cane of slightly drooping habit, fairly healthy, and possessing long internodes. Fairly satisfactory as regards yield and stooling qualities, but suffered slightly from borer attack.

10. Horne.—Gave disappointing results, the yield being very poor. This cane is short, stools badly, is given to the undesirable production of roots from the nodes, and the eyes show a strong tendency to sprout. It was attacked by borer, the loss amounting to roughly 5 per cent. It is evidently not suited to the present environment.

*See *Agricultural News*, Vol. XIII, p. 227.

†Barrowcliff, M., *Agricultural Bulletin of the Federated Malay States*, Vol. III, No. 2.

RESULTS IN CONNEXION WITH THE SUGAR-CANE FROM THE VARIETY PLOTS, WINKEL SPRUIT, HARVESTED IN NOVEMBER 1915.

Variety of Cane.	Weight of cane per acre in tons.	Percentage of juice by mill.	Quotient of Purity.	Composition of Normal Juice. In lb. per gallon. Sucrose.	Glucose.	Solids not Sugar.	Glucose Ratio.	Gallons of juice per acre.	Sucrose, in lb. per acre.
Antigua B.15†	23½	63·7	94·4	2·19	0·029	0·101	1·33	2,740	6,010
Demerara D.74	28½	68·8	95·4	1·99	0·023	0·074	1·16	3,620	7,200
,, D.95	16	61·4	95·1	2·14	0·025	0·085	1·15	1,810	3,880
,, D.109	29½	65·7	95·9	2·20	0·022	0·073	1·01	3,560	7,810
,, D.145	23½	60·2	92·6	2·02	0 047	0·114	2·33	2,610	5,260
,, D.625	35	64·3	93·8	2·14	0·047	0·095	2·18	4,130	8,860
Queensland No. 2	23¾	61·8	92·6	2·22	0·026	0·152	1·16	2,680	5,960
,, No. 3	24	65·4	93·5	2·04	0·022	0·119	1·09	2,980	6,080
Honolulu Rose Bamboo	24¾	64·0	94·2	2·00	0·030	0·093	1·51	3,370	6,740
Horne	28½	68·3	93·3	2·09	0·034	0·116	1·64	1,760	3,680
Java No. 106*	14	62·2	92·2	1·86	0·031	0·123	1·65		
,, No. 147*		60·7	91·6	1·71	0·038	0·119	2·23		
Cheribon*		66·3	87·4	1·62	0·050	0 184	3·07		
Agaul (from Sultanpur)*		62·0	86·2	1·61	0·038	0·220	2·39		

*Areas too small to give accurate results as regards yield.

† Apparently Barbados seedling No. 15 obtained through Antigua though no record can be found that this cane was experimented with either in Antigua or Barbados. It may refer to A.15, though this variety was not obtained until 1909—apparently some years after the cane was introduced into Natal. A third possibility is that D.115 is referred to—a well-known variety twelve years ago.—Ed. *A.N.*

11, 12 and 13. The Java varieties (from Egypt).—Produced very poor results, judging by the yields from the small areas tested. With the exception of the variety Cheribon, the yield of juice was disappointing and the percentage of sucrose was also very low. It is, however, necessary t. state that the land in which they were planted was very unsatisfactry in texture, and as a result of this only about 30 per cent. of the plant cane germinated. All the three varieties are healthy in appearence, stout, and possess long internodes. They ratoon well and are remarkably free from adventitious roots and incipient shoots.

14. Agaul (from Sultanpur).—This is the only variety of the Indian canes that showed any promise at all, but both in yield and milling qualities it has hitherto proved to be much inferior to the Demerara varieties.

Manurial Experimemts with Uba Cane.

The following abstract has been prepared from the information given in the article on this subject:—

These experiments, which have now been in progress for nine years on ratoons, indicate in regard to the relative effect of the different constituents, the disastrous effect of leaving out phosphates without which the yield was little better than without manure at all. Without nitrogen there was even a slightly greater gain than with it. The average yield from a dressing of superphosphate and potash was about 2½ tons per acre more than that from superphosphate alone. These conclusions are drawn from the following table:—

GAIN OF CROP PER ACRE FROM MEDIUM DRESSINGS OF COMPLETE AND INCOMPLETE MANURES (AVERAGE OF THE FIVE CUTTINGS).

	Complete manure.	Phosphate & potash only.	Nitrogen & potash only.	Nitrogen & phosphate.	Phosphate only.
	Tons lb.	Tons lb.	Tons lb.	Tons lb.	Tons lb.
Series A.	5 1,685	6 315	0 1,354	1 1,423	3 52
Series B.	4 1,352	5 786	1 569	4 217	3 583
Average	5 518	5 1,550	0 1,961	2 1,820	3 317

The relative ineffectiveness of the nitrogen is remarkable in the light of West Indian experiments, and can only be explained on the assumption that the soil was sufficiently supplied with this constituent beforehand.

The Supplement to the Jamaica *Government Gazette*, February 18, 1915, consists of a report of the Agricultural Society's Board concerning Agricultural Credit. In the general remarks it is said that, as hitherto, one of the weak points in connexion with the working of the Loan Banks is the book-keeping. Efforts have been made to bring about improvement and uniformity, but much pressure will be necessary before complete success can be attained in this respect.

In Messrs. Lewis and Peat's Annual Report on the Indigo market for 1914, it is pointed out that the synthetic product is entirely a matter of the percentage of indigotin, while vegetable indigo contains important by-products such as indirubin, indigo brown, etc., most valuable assets in the dyeing and wear of cloth. The indigotin test in vegetable indigo is an indication as to the quality, but it is not an all-important feature. Many of the best marks do not always give a relatively high test, but practical dyers know well what the intrinsic merits of the Indigo are, and are prepared to pay correspondingly high rates for it.

FRUIT AND FRUIT PRODUCTS.

GREAT BRITAIN'S SUPPLY OF ORANGES AND LEMONS.

'Home Counties', the well-known writer on agricultural matters, has some interesting remarks to make in the *World's Work* of April 1915, in connexion with oranges and lemons. Speaking of the different kinds of oranges, it is said that the cheapest kind are obtained from Spain, whereas California is noted for the more expensive seedless orange. One of the good things done of recent years has been to get the West Indies to take more trouble in packing. Jamaica in particular has excellent fruit, though its pale appearance is against it in the case of those who have no real knowledge of the fruit.

As regards the time when oranges arrive on the English market, it is said that Spain begins sending fruit in November and continues to do so until the end of March, though some fruit may be arriving in May or June, and even August. West Indian fruit arrives from September to December. Jaffa oranges used to arrive between November and March; the Natal and Rhodesian fruits reach England at about the same time as the Naples fruit, that is June onwards to August and September. As regards the best time to consume oranges, February and May is suggested for the Spanish fruit, but 'the West Indian fruit, because they are not so acid, is good at all times.'

The mark of a good orange is a thin silky skin, firmness and weightiness. The inferior has a coarse thick skin and a puffy interior. The author tersely defines the best orange as 'the one which is the most difficult to get out of its skin.' All good oranges, he says, are more or less coloured, but the West Indian fruit, 'which is excellent, is more like grape-fruits or lemons in tint.'

Turning more particularly to the subject of lemons, it is observed that more than three-quarters come from Sicily. During the season 1913-14 there arrived in England 530,000 boxes of lemons. Some 298,000 were from Palermo, 132,000 from Messina, 50,000 from Naples, 32,000 from Malaga, and 17,000 from Murcia. Most of these boxes contained from 300 to 400 fruits, but some of the Murcia boxes contained only 200.

EXTENDING THE MARKET FOR GROUND NUTS.

The Director of the Imperial Institute has forwarded from the Technical Information Bureau of that establishment a statement dealing with the question of finding a market in the United Kingdom for the large quantities of ground nuts from British possessions which cannot at the present time be fully absorbed by the continental markets to which they have hitherto been exported. Copies of this statement, the principal points in which are reproduced below, have been extensively circulated amongst oil seed crushers and produce merchants in the United Kingdom. It is hoped that as a result of this action a considerable proportion of the supplies will be taken by the United Kingdom, and the ground nuts used there for the production of ground nut oil and ground nut feeding cake as well as for edible purposes.

The chief countries of the world from which ground nuts are exported are, in order of importance, India, Senegal, Gambia, China and Nigeria. The value of the exports range from £3,254,246 in the case of India, to £174,716 in the case of Nigeria. The value of the total exports is nearly £4,000,000. In addition, attention is being given to this crop in other parts of the Empire, including East and South Africa and the West Indies. The chief importing countries for ground nuts in order of importance before the war were France, Germany and Holland, and the most important crushing centres, also in order of importance, were Marseilles, Bordeaux, Dunkirk, Hamburg and Delft. In normal times France imports ground nuts valued at nearly 6½ million pounds sterling, but since the war this country has been unable to take its normal supply. For this reason, and for the fact that Germany is unable to receive her usual quantity valued at over £1,300,000, the attempt referred to at the beginning of this article of creating a market in the United Kingdom is being made.

The principal feature of interest in the statement under review is that which urges an extended employment of ground nuts in the United Kingdom as an article of diet. It is suggested that this material might be more extensively employed in prepared foods as, for example, in the form of peanut butter, and as a vegetable. As regards food for live-stock, the residual cake after the expression of oil is one of the richest feeding stuffs known.

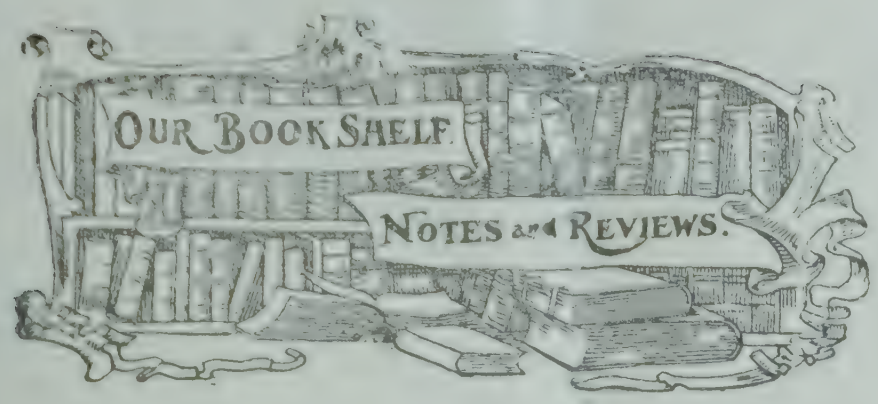
As mentioned previously in the *Agricultural News*, in connexion with this subject, it is not to be expected that the area under ground nuts in the West Indies will be increased since this product is not so important a staple, and cannot be grown as satisfactorily as food stuffs like Indian corn and beans. It will, however, be of interest to the readers of the *Agricultural News* to learn that efforts like the one described in this article are being made in the United Kingdom to find an outlet for those tropical products whose consumption has been seriously affected through the war.

THE FERMENTATION OF CACAO.

The following account of an interesting experiment conducted in Ceylon, is taken from the *Tropical Agriculturist* (February 1915):—

The old method of adding the vinegar from one vat of fermenting cacao to the new vat for fermentation has been tried again, in order to hasten and to obtain a more equal fermentation throughout. But in this case the vinegar was warmed to a temperature of 78 per cent. before being added to the cacao in order not to check the fermentation, when once started. As one vat will not yield sufficient vinegar, the same amount of water is added and mixed with the vinegar. The cacao is not removed from the vat at all during this process, but the vinegar and water well stirred in by being lightly trampled on. Thus an even temperature of 87 per cent. is maintained throughout the sixty-four hours of fermentation. The cacao receives two additions of vinegar and water at a ratio of about 3 gallons of mixed vinegar and water to about 700 lb. of wet cacao.

Samples of cacao treated in this manner and by the ordinary method of adding cold water have been submitted to Messrs. Keell & Waldock, who reported as follows: 'Of the two samples of cacao you sent us for our report, in our opinion the sample cured by your usual method is decidedly the better both in break and in general appearance. In the sample cured by cacao vinegar the break is soft and dull in colour, and the dull appearance of the bean prevents it from passing as No. 1 quality.'



LES PLANTES TROPICALES ALIMENTAIRES ET INDUSTRIELLES DE LA FAMILLE DES LEGUMINEUSES. (Useful Tropical Plants of the Leguminosae) by P. de Sornay. *A. Challamel, Librarie Maritime et Coloniale.* Paris, 1913.

Though the courtesy of Mr. J. P. Ogilvie, F.C.S., editor of the *International Sugar Journal*, we have been furnished with a copy of the original French version of this book pending the arrival of the English translation which is now passing through the press. The book is of special interest to the West Indies at the present time on account of the increased attention that is being given to leguminous crops.

In the preface to the volume, the author who has had many years' experience as Assistant Director of the Agricultural Experiment Station in Mauritius, refers to the assistance given him by Mr. Bonâme, until lately Director, and it is to be observed in perusing the volume that Bonâme's original work, especially in regard to the chemical aspects of the subject, has been freely drawn upon.

The book has been planned with considerable lucidity, and the arrangement displays a broad grasp of the subject under treatment. Discussing in the first two chapters the fixation of nitrogen by the Leguminosae, the author then proceeds in Chapter III to his principal task of describing (with tables of analyses and excellent illustrations) the different species useful as soil improvers, as fodder crops, and as food for human consumption. Following this are chapters dealing with the comparative value of different species as green dressings, the significance of manganese and of hydrocyanic acid in regard to the Leguminosae, and the nature of the starch grains typical of different edible seeds of this Order. The nutritive aspects with particular regard to the feeding of animals receive attention in Chapter IX, and this is followed by others in which the gum and resin-yielding species are described, as well as those yielding useful timber, textile material and medicines. After giving an account of the principal ornamental plants, and useful tables showing the average chemical composition of the different species, the volume concludes with lists of parasitic fungi and insect pests attacking different species, ending with an index to all the species of plants referred to in the text (other than those of a purely ornamental nature). The number of species referred to in this index is 366 out of the 7,000 known to science as belonging to the Order.

This brief survey of the contents is sufficient to show that the compilation brings together a large amount of useful information—some of which has not been published before—and indicates above all the highly important position occupied by the Leguminosae in the economy of tropical agriculture.

Being essentially a work of reference it would be unnecessarily tedious to review the contents in detail. The statements made appear to be sound and accurate, and judging by the bibliography, most of the leading authorities have been consulted. It should be pointed out, however, that some of the species dealt with are not strictly tropical, for example, the Soy bean and *Vicia Faba*. Some of the author's conclusions deserve special attention. His favourable opinion of the Canavalias as bean crops is noteworthy in view of the suspicion with which these beans are regarded in certain quarters. He thinks this suspicion is simply the result of over-generalizing on the basis of the coloured Lima (*Phaseolus lunatus*), *Mucuna atropurpure*·, and *Dolichos bulbosus*, all of which may certainly exhibit poisonous characteristics. While speaking of poisonous plants it may be noted that a list of dangerous Leguminosae is given, including such species as contain, for instance, saponin; and *Leucaena glauca* which, when consumed by horses and mules, causes the hair to fall from their tails.

In estimating the value of one species compared with another as a rotation crop, the author takes various matters into consideration, but concludes that it is impossible to say which is superior since almost everything depends upon the climatic conditions under which each is grown. Soil and climatic conditions are more important than relative chemical compositions and recorded yields. Coming to the question of manganese as a factor of fertility, reference is made to Bonâme's view that in Mauritius soils the metal acts as a base for nitric acid in the absence of lime; the author thinks that the chief benefit derived from manganese is its physiological effect on the plant. These views are of interest in connexion with recent work in Hawaii on the same subject.

It seems ungracious to conclude a review of a useful compilation by referring to its minor blemishes, but the misplacement of pages 473, 474, 471 and 472 in the tables of analyses at the end is unfortunate, and Fig. 66 stated to represent *Caesalpinia pulcherrima* (the so-called 'Barbados Pride', of the West Indies) does not do so. For these mistakes, however, the author is hardly responsible, and we may conclude with an expression of thanks in appreciation of the useful service he has rendered to our agriculture, and of the justice he has done to this Natural Order which is so wonderfully represented in the Tropics.

W. R. D.

During the present year further progress has been made at the Quetta Fruit Experiment Station in designing suitable fruit packages for the five-seer parcels rate. In the original Quetta peach crates, chip compartments were used for each peach and laths were employed for the top and bottom of the box. The separate laths were found to be unsuitable in practice on Indian railways on account of the comparative ease with which thefts in transit could be carried out without risk of immediate detection on delivery of the crates. Further, the labour of making the separate chip compartments was considerable.

Two changes have been made in the Quetta peach crates by which the above disadvantages have been entirely removed. In place of the separate chip compartments, a collapsible card-board fitting has been used. This folds flat and is imported ready for use. Two box boards, which leave a ventilation space of about $\frac{1}{5}$-inch down the middle of the box, are used instead of the narrow laths. These cannot be removed in transit unless the lead seals are broken. (*Agricultural Journal of India.*)

COTTON.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended May 1, is as follows:—

There continues a demand for the Planters' crop lots remaining in stock, but at prices 1c. to 2c. below the views of the Factors, who are inclined to be firm in consequence of the recent advance in Savannah for Georgias and Floridas; consequently we have no sales to report.

A lot of 118 bales repacked cotton, reclaimed from a recent fire, was sold at about 23c.

The supply of Fine to Fully Fine odd bags is very small and firmly held at 24c. to 25c.

We quote, viz:—

Extra Fine 24c. to 25c. = 15*d.* to 15½*d.*, c.i.f. & 5 per cent.
Fine to Fully Fine 23c. to 24c. = 14½*d.* to 15*d.* „ „ „
Fine, off in colour 20c. = 13*d.* c.i.f.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, and Manchester, up to May 1, 1915, were 103 and 1,651 bales, respectively.

The Cotton Worm.—According to a note in the *Journal of Economic Entomology*, the past season witnessed an outbreak of the cotton worm (*Alabama argillacea*) which was the most severe experienced in the cotton belt for many years. In parts of Arkansas and Mississippi all the green portions of the cotton plants were destroyed in October. Ordinarily this outbreak would have attracted more attention, but the peculiar conditions which prevailed in regard to the marketing of the crop were such that the insect's injury was not generally considered important.

Cotton-seed Oil in Butter.—An interesting article appears in *Nature* (April 8, 1915) entitled Modern Substitutes for Butter. Many tropical products are utilized, particularly cotton-seed oil, coco-nut oil and palm kernel oil, as well as the Shea and Suari nut oils. These form common constituents of margarine. In the utilization of edible vegetable oils like the above, as substitutes for animal fats found in milk, everything depends upon skilful refining, and it is certain that as the knowledge of refining processes increases, the development of the industry will be still greater.

One of the conclusions arrived at in Bulletin No. 168 of the University of Illinois Agricultural Experiment Station, which deals with the study of the development of growing pigs, is that daily rations of ground corn, blood meal, and an ample amount of calcium phosphate, containing respectively 0·70 and 0·94 lb. of digestible protein, and yielding respectively 4·28 and 4·29 therms of metabolizable energy per 100lb. live weight, are sufficient for the normal nutrition of young, growing pigs.

INDIAN CORN.

FEEDING AND MANURIAL VALUE OF MAIZE.

The following paper was read by Dr. H. A. Tempany on April 9, 1915, at a general meeting of the Antigua Agricultural Society:—

In view of the considerable interest now being aroused in Antigua and other West Indian islands in the cultivation of maize, the following notes concerning the feeding value and manurial requirements of the crops may be *apropos* at the present time, and at the same time may also serve a useful purpose by affording clear and definite information on certain points, which have hitherto been locally the subject of a considerable amount of vague speculation.

In the first instance, to deal with the manurial requirements of the crop. Determinations performed in the Government Laboratory here have shown on analysis the following contents of manurial material for the grain itself:—

On water free material, nitrogen 1·96, phosphoric acid 0·89, potash 0·31.

In relation to the cob similar determinations showed the following results:—

On water free material, nitrogen 0·43, phosphoric acid 0·22, potash 0·29.

The relationship borne by the weight of corn to the weight of cob has also been studied both in the Laboratory and in the Government Granary; of course this varies considerably with different varieties, but with the average run of corn encountered in Antigua at the present time, the mean value of 80 per cent. can I think be assumed with safety. In South Africa, Mr. Burtt Davy gives 82·13 per cent. as mean value for this figure with a range of from 73·88 per cent. to 86·83 per cent.

In order to arrive at the actual amount of manurial material removed in a crop of maize, it is further necessary to know the average amounts of moisture contained in field-dried grain and cob. As the means of a large number of determinations we have found that Antigua field-dried corn contains, on the average, 16·6 per cent. of moisture, while the air-dry cobs show 9·5 per cent.

From these data we can calculate the amount of manurial material removed in crops of corn of various dimensions. Under West Indian conditions there does not appear to be any reason to doubt that average crops of shelled grain at the rate of 40 bushels per acre at least may be looked for.

From the above values it follows that in a crop of these dimensions the following amounts of manurial material are removed:—

	Grain.	Cobs.	Total cobs and grain.
Nitrogen	36·65 lb.	2·19 lb.	38·84 lb.
Phosphoric acid	16·64 „	1·12 „	17·76 „
Potash	5·80 „	1·48 „	7·28 „

This in terms of manures in ordinary use is approximately equivalent to 2 cwt. of sulphate of ammonia, 1 cwt. of basic slag, and 14 lb. of sulphate of potash, and contains approximately the same amount of manurial material as 2½ tons of good pen manure.

It must not be forgotten, however, that in addition to the grain and cobs, the corn stalks or stover are also responsible for the removal of manurial material from fields bearing corn.

It is true that this part of the crop does not usually go off the estate, and is either buried in the field after the crop is taken off, or placed in cattle pens to serve as fodder and litter thereby being converted into pen manure subsequently.

No actual data are available at present for the proportions of stover to ears under West Indian conditions; but the following information has been abstracted from results obtained in other parts of the world. From this it appears that the weight of the maize stalks obtained is slightly larger than the weight of grain, the figure actually quoted is that 1 ton of corn on the cob is equivalent to 2,290 lb. of stover.

From the results of analyses it further appears that in relation to a crop of the dimensions already specified, the following weights of manurial material are removed in the stover: nitrogen 39·0 lb., phosphoric acid 6·0 lb., potash 11·0 lb.

Combining these figures with those already quoted, we see that the total amounts of manurial material removed in grain and stover by a crop of 40 bushels of shelled grain per acre are as follows: nitrogen 78 lb., phosphate 24 lb., potash 18 lb.

This is equivalent to 4 cwt. of sulphate of ammonia, $1\frac{1}{2}$ cwt. of basic slag, 36 lb. of sulphate of potash, or about 5 tons of good pen manure.

It is often stated that maize is an exhausting crop, but I think these figures demonstrate that at any rate maize cultivation is no more exhausting than sugar-cane, when due regard is paid to the length of time that each is in the ground.

Maize is a three-months' crop, and at the rate of two crops a year a return of this description involves loss of manurial material at the equivalent rate of 5 tons of pen manure in a year, if care is taken to return the stover to the field. On a previous occasion I have shown that an application of pen manure at the rate of 20 tons per acre provides sufficient manurial material for the needs of a crop of plant canes, first ratoons and possibly second ratoons, provided that care is taken to return the trash to the land.

In the case of corn, provided that the corn stover or its equivalent is given back to the land also, 20 tons of pen manure would give manurial material sufficient for eight crops of maize of 40 bushels each, or a total of 320 bushels of grain in all.

In concluding this discussion three points require additional attention; the first of these is that maize is essentially a shallow rooting crop, and its root system does not as a rule travel much below the top 4 inches of soil. Consequently thorough and frequent tillage is necessary so that the soil from a somewhat deeper level is brought to the surface and made available to the needs of the plant; otherwise, with continuous cultivation the upper layers of the soil may tend to become permanently exhausted.

Indeed this state of affairs confronts grain growers the world over, and is the origin of the normal rotations of grain and roots practised.

The second point is that with maize, as with all crops, a factor limiting production is the water-supply available for growth.

I have sometimes heard it suggested that by increased manuring greatly increased returns of crops such as sugar can be produced. While this is true within limits, it must be remembered that these limits are quite definitely fixed by the water-supply; plants require a definite amount of water for the formation of unit weight of dry matter; the actual amount varies in the case of different crops and, to some extent, with conditions; but in the case of individual crops and conditions the value is roughly constant. With a limited water-supply, therefore, possible production is also limited, and manuring to meet plant requirements in excess of this possible production in the hope of securing very large yields, is merely wasteful.

The third point is in relation to organic manuring. I do not wish it to be thought from the foregoing that the suggestion is put forward that fertility can be maintained by means of artificial manures alone. I have on many occasions reiterated my opinion that the maintenance of the control of organic matter is indissolubly bound up with the maintenance of fertility of soils in the tropics.

In the absence of it, the soil rapidly loses in tilth, which may perhaps be defined as good mechanical condition combined with the maintenance of a favourable equilibrium in relation to the various biological processes which go on in it.

Turning now to the feeding value of corn, determinations in the laboratory have shown that an average sample of Antigua corn has the following composition:—

		Range in Connecticut.
Moisture	10·8	
Protein	10·82	8·9 to 1·33
Fat	5·5	4·4 7·3
Fibre	1·9	1·2 1·2
Ash	1·5	1·4 2·4
Corbohydrates	69·4	

From this it follows that the values found for the Antigua corn occupy a good average position over the range quoted. Of course this result only represents one sample; but there is no reason to suppose that this was not representative.

Questions are often raised in relation to the feeding value of corn cobs, and the following analysis supplies information on that point:—

CORN COBS.

Moisture	8·7
Protein	2·4
Fat	1·0
Fibre	29·8
Ash	1·8
Carbohydrates	56 3

The above results demonstrate that corn cobs have a distinct feeding value and are by no means to be despised as fodder. Incidentally it bears out the soundness of the policy pursued on many estates of grinding the corn and cobs together to form corn and cob meal, and feeding the product to the estates stock.

The foregoing notes are put forward in the hope that they may serve to settle a number of points that have been in dispute for many years, and at the same time correct one or two fallacies concerning corn which have from time to time gained currency.

In the recent Cassava number of the *Bulletin of the Department of Agriculture*, Trinidad and Tobago, mention is made of the cost of cultivation of this crop in the West Indies. In Jamaica it ranges between £3 10*s.* and £5 per acre, and a well managed estate could be run at £4. In St. Vincent it costs about £4 an acre, and in Trinidad it appears reasonable to estimate that the cost should not exceed £5 to £6. With a return of 8 tons per acre there was hope of a fair profit.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the functions of calcium carbonate in the soil with special reference to the Tropics.

A review of an interesting book dealing with useful tropical plants of the Natural Order Leguminosae, appears on page 165.

The feeding and manurial value of Indian corn (with special reference to Antigua) receives attention on page 166.

Insect Notes, which will be found on page 170, deal with the difficulties of plant quarantine.

The fruit articles in this issue deal with the marketing of oranges and ground nuts, and the fermentation of cacao.

Exports from Dominica, 1914.

A statement of the imports and exports of Dominica in 1914 discloses that the value of the lime products exported was £149,018, compared with £142,431 in 1913, and £96,673 in 1912. An analysis of the first total given, shows it to be composed of the following items: limes, green, £43,237; limes, pickled, £572; lime juice, raw, £25,753; lime juice, concentrated, £68,754; lime juice cordial, £564, lime oil, distilled, £4,176; lime oil, écuelled, £5,962.

Oranges were also shipped valued at £518, and orange oil £135, whilst the cacao exported was worth £20,024—a falling off on the previous year's figures of £4,735. Coco-nuts were valued at £1,733—an increase of £746 over the previous year's export, whilst Bay oil was valued at £461.

Most of the produce represented by the above returns went to the United Kingdom.

Treatment of Seeds for Planting.

The following practical suggestions have been issued by the Jamaica Agricultural Society in regard to the treatment of seeds for planting:—

All corn (maize), and especially Guinea corn (Sorghum) seeds should be treated before planting to prevent them being eaten by mice, rats, ants and birds. When Guinea corn is planted without any safeguard it is usually the case that ants attack it within a few hours of planting, eat out the germ, and few of the grains grow; then the seed is blamed.

There are two simple ways of treating these grains. For Guinea corn we prefer to take a pudding pan half full of wood-ashes; take enough kerosene to damp this, but not to make a thin paste. Soak the seeds for two or three hours in water, then put them in the mixture and shake it through. The seeds get coated and can then be planted: some then shake through a sieve to get rid of the superfluous wood-ashes, but this is not necessary.

The corn (maize) can also be treated in this way or by being coated with tar. Take coal tar, thin it with kerosene if necessary, put the corn in a sieve or pudding pan with holes punched in it, then pour the tar on and let it run through; or the corn can be put in a bucket or kerosene tin, the tar poured on, the tin shaken until all the corn is treated, and the superfluous tar can be poured off. The tar method is a messy one but very effective.

We have found it sufficient to soak the grain in tar water which is made by keeping water for some weeks on tar, and stirring occasionally; then draw off enough of the water to soak the seed for three or four hours in it.

Altogether the kerosene and wood-ashes method is the cleanest and easiest.

Agricultural Bank Legislation.

At a meeting of the Legislative Council, St. Vincent, on December 22, 1914, the Administrator moved for leave to introduce a Bill for 'An Ordinance to amend The Agricultural Credit Societies Ordinance 1913.'

Since the principal Ordinance had been passed in 1913, His Honour informed the Council, nine societies had been formed and the £500 set aside for the purpose had been loaned out to them. In addition to this one or two private individuals had lent money to the Societies, and the Colonial Bank, as a result of an interview he had with the Chairman recently when in London, had now also agreed to make loans to them to the extent of £1,000.

He had while on leave also taken advantage of the opportunity to consult with Sir James Douie who was a recognized authority on the subject of Agricultural Credit Societies and was now connected with the movement in England and Ireland. Sir James Douie had very kindly gone through our legislation in regard to these Societies, and had made certain suggestions for its improvement. These suggestions were embodied in the Bill before the Council.

The Colonial Bank had also put forward suggestions for the amendment of the Ordinance and Rules, and most of these had been adopted. The main effect of these amendments was to place the private lender in the same position as the Government in regard to safeguards, and to strengthen his position, and the amendments should have the effect of removing any lingering doubts which private lenders might still harbour regarding the soundness of the investment. The motion was seconded by the Treasurer and leave was granted.

A Cheap Form of Radium.

In discussing the possibilities before the application of radium in Agriculture, in a recent article in this journal, attention was called to the importance of the initial cost of the radio-active material. 'No little interest, therefore,' says the *Colonial Journal* (April 1915) 'attaches to the discovery of two distinguished French chemists that radium is present in coal, and a substance has been prepared consisting of coal dust in fine powder mixed with a solution of radio-phosforate of potash. One ounce of the radio-phosforate is dissolved in three or four gallons of water and mixed with 112 lb. of coal dust; it is claimed that the radio-phosforate acts on the coal dust and causes it to amalgamate with the soil. The radio-phosforate is sold at 2*s* 6*d*. per oz., or 'lignaite', the compound of the radio-phosforate and coal dust can be supplied. At a time like this when it is so important to grow vegetables quickly and abundantly, the discovery may be extremely beneficial, though whether it will meet expectations remains to be seen.'

In connexion with the above, an interesting paper on the industrial uses of radium appears in the *Journal of the Royal Society of Arts* for April 16, 1915. This will be dealt with in the next issue of the *Agricultural News*.

Antigua Corn Granary.

A copy of a circular recently issued by Dr. Tempany, Superintendent of Agriculture for the Leeward Islands, under direction of His Excellency the Governor, has been received at this Office, notifying that the Antigua Government Granary will be opened for the handling of maize on and after May 3, 1915, from which date corn will be accepted for delivery on the terms specified in His Excellency's Proclamation of January 16 last (see *Agricultural News*, Vol. XIV, No. 334, p. 53).

The following are the terms on which deliveries will be accepted: (1) The co-operative plan whereby a first payment of 2*s*. 6*d*. per bushel of shelled grain is made to growers, to be followed by a distribution of the surplus profits of the undertaking after paying all expenses and deducting 25 per cent. as the profit of the granary. (2) The purchase of corn for cash at the rate of 3*s*. 6*d*. per bushel of shelled grain. The quantity which will be purchased in this way is limited to 5,000 bushels, and in the first instance the time during which this offer remains open terminates on June 30 next. (3) The kiln-drying of corn, for which a charge not exceeding 6*d*. per bushel will be made; the actual price charged for kiln-drying will be decided on the results of working, and may be modified from time to time as circumstances dictate.

Further it is insisted that corn for purchase by the granary must be clean, sound and sun-dried, and corn on the cob must have the husk removed; not less than 100 lb. of corn on the cob or 80 lb. of shelled grain will be purchased; corn on the cob for delivery should for convenience be put up in bags weighing 100 lb. each—bags to be returnable; corn sent to the granary for drying must be packed in bags, in which the kiln-dried grain will be returned; corn will not be stored after drying for more than two days, and intention to deliver corn at the granary should be notified to the Manager two days before delivery is effected, and at the same time information furnished as to the manner in which the corn is to be handled.

It is mentioned that arrangements are also being made for the erection of a meal-making machine at the granary, and in addition to the operations of kiln-drying, it is anticipated that facilities will shortly exist for the conversion of corn into corn meal, for persons so desiring. Particulars concerning this are promised shortly. The management of the granary is vested in a Board appointed by the Government, and, it is added, the Government of Antigua reserves to itself the right of selling corn under the title of 'Antigua Granary, Kiln-dried Corn'.

Finally it is pointed out that kiln-dried corn requires to be stored under proper conditions in order to insure its keeping in good condition. Neglect of this precaution can only result in disappointment and loss. It is hoped that abundant success will attend this new departure in the Leeward Islands.

INSECT NOTES.

THE DIFFICULTIES OF PLANT QUARANTINE.

Soon after the establishment of the Imperial Department of Agriculture, some sixteen or more years ago, the subject of preventing as far as possible the introduction of insect pests and plant diseases into these islands was taken up, and its importance was repeatedly impressed upon the Governments of the several islands. For several years now laws have been in force in all the Windward and Leeward Islands and in Barbados having for their object a regular quarantine system for imported plants. In the same period of time great strides have been made in the United States and in most other countries of the world where attempts are being made to prevent the introduction of new pests. These attempts are being made along two lines. One, as in the West Indies, deals especially with pests of staple crops, having only general regard to insects attacking minor crops and ornamental plants; while the other line of attempt has for its object the interception and destruction of every pest of all crops and plants, potential as well as actual.

The total prevention of the entrance of insect pests is a gigantic task. In California, where perhaps the quarantine regulations are more comprehensive than elsewhere, practically every avenue of entrance for insects is guarded, not only in the case of arrivals from points beyond the continent such as China, Japan, the Phillipines and the Hawaiian Islands, but also from the adjoining States, and from Canada and Mexico.

Inspectors employed for the purpose not only have the right, but are required by law to search freight and express parcels, and also passengers' baggage and hand baggage for all plant material, infected material; and all fruits and other plants, seeds and cuttings arriving from any port or place from which the importation of plants is prohibited, are confiscated and destroyed. This inspection does not, or did not, extend to material forwarded through the post, and here is the weak link which may decide the strength of the chain.

In a recent number of the *Monthly Bulletin* of the State Commission of Horticulture (Vol. III, No. 11, p. 465), Mr. Frederick Maskew, who is in charge of the administration of the plant quarantine law, publishes a short article entitled 'A Leak in Our Quarantine'. Here it is shown that in spite of great progress and an increased staff, there exists a great danger of serious pests of important crops being introduced through the mails, which are immune from quarantine inspection. It is stated that cotton is a very promising crop for the State of California with a wide area suitable for its requirements, which at present is free from the pests of this crop. It is hoped to keep out such important pests as the boll weevil and the pink boll worm, but the danger of their introduction is shown by the fact that cotton bolls and cotton seed have been sent into the State from a district in the cotton belt, and while the chance of these insects being introduced in that manner is rather a remote one, it is still possible. The instance cited was that of a small parcel containing a cotton boll and cotton seed put up as a souvenir. Instructions for planting the cotton seed were included in the container.

This instance is cited merely to show how simply the work of experts and the expense and organization directed toward prevention might be entirely brought to naught.

In the Lesser Antilles, the provision for preventing the introduction of new pests is necessarily adapted to the resources of these small communities. Is is not possible to employ in each island a staff of trained entomologists, sufficient in number to make possible the careful inspection of all freight, parcels, baggage and hand baggage, and it is not desired to interfere with trade by imposing unnecessary restrictions on the conditions of trade and travel.

It is hoped that the means employed will greatly reduce the chances of new pests being introduced, and it is quite possible that they may answer the purpose as well as more elaborate and more expensive methods. Each community will of course be specially interested in excluding the pests of its principal crop. Thus in all the islands where cotton is grown, the importation of cotton seed from any point where the cotton boll weevil is known or believed to occur is prohibited except in small quantities for experimental purposes with government sanction.

This precaution would be useful also in the case of the pink boll worm, which, probably a native of India, is now a pest in Egypt and occurs or is likely to occur in many other places.

In Barbados, cotton stainers do not occur, and the desire to prevent the introduction of these insects has resulted in a law which provides that all cotton seed imported for the extraction of oil shall be fumigated.

In all these islands a definite attempt is made to destroy scale insects on imported nursery stock and ornamental plants.

The froghopper and the giant moth borer of sugar-cane are also pests which have been made the subject of special legislation in certain of the islands.

Dr. H. T. Fernald, in his address as President of the American Association of Economic Entomologists, at the annual meeting at Philadelphia in December last, said in the course of his remarks: 'modern transportation has rendered easy the introduction of the pests of other countries, and in spite of all the laws, supervisory boards and inspection now actively at work, some of these pests at least are sure to slip in.' This statement, together with that quoted in the last number of the *Agricultural News*, from Bulletin No. 186 of the U.S. Department of Agriculture, to the effect that a perfectly reliable method of destroying insects present in imported seeds is much needed, will serve to show that the difficulties of preventing the introduction of pests on or in imported plants are well recognized.

It is also recognized that the existing methods of fumigation are far from perfect. The degree of efficiency attained by fumigation depends on the nature of the material fumigated, and the gas used for the purpose, as well as the conditions under which the process is carried out.

Plants which carry scale insects on their leaves and bark may be treated with a fair amount of success by fumigation with hydrocyanic acid gas, but it is too much to hope that this method will always kill 100 per cent. of the scale insects and their eggs, with one fumigation. Mealy-bugs at the roots of plants, soil-inhabiting grubs, and froghopper are all likely to escape the full consequence of the fumigation from the protection they get from the soil. Cotton seed is fumigated with difficulty, as is shown by the report of the Superintendent of Agriculture, Barbados, for 1912-13, in which it is stated that certain experiments which were carried out 'conclusively proved that sulphur dioxide was ineffective beyond a depth of 3 inches on either side of the tubes,' i.e., that this insecticide has the power of penetration only to a distance of 3 inches in cotton seed: it is further stated that hydrocyanic acid gas proved to be even less satisfactory in this connexion. Carbon bisulphide, on the other hand, proved satisfactory, but this material is costly, and to a considerable extent dangerous to use.

The difficulties of controlling the importation of plant pests is sufficiently illustrated by the foregoing. They may arrive by many avenues, such as freight, parcels, ordinary post, and baggage of all sorts. Inspection by a staff of trained entomologists is desirable, but this involves much expense, which is out of proportion to the means of small communities, and even the best inspection cannot be relied upon to give absolutely perfect results. Fumigation also, while the best treatment available, falls short of perfection in results. It is possible that fumigation in partial vacuum (see *Agricultural News* for May 8) may increase the efficiency of this treatment.

So far as is known, no new pests have been introduced into these islands since the plant quarantine laws have been in operation, except that leaf-blister mite of cotton made its appearance in Barbados in the early part of 1912. This may be considered as a fairly satisfactory state of affairs, and as an indication that the present system, while not perfect, is worth persisting in so long as it gives a maximum of protection with a minimum of interference with the conditions of trade and travel.

CANADA-WEST INDIES PREFERENTIAL TRADE AGREEMENT.

The *Canada-West India Magazine* for April 1915 publishes what purports to be a first report by Mr. Watson Griffen on the Canada-West Indies preferential trade agreement. One result of the contract made between the Canadian Government and the Royal Mail Steam Packet Company, has been that exporters of Canadian food products and manufactured goods now have easy access to all the colonies that joined the Canada-West Indies preferential trade agreement. As to the value of the trade between Canada and the West Indies, the figures for 1912 are taken as more representative of ordinary conditions in the British West Indies than those of 1913, for the following reasons. The year 1912 was the last complete year before the preference went into effect, and as the preference began in June 1913, only part of that year was under the preference, hence it is not regarded as a suitable year for comparison; and the figures for 1914, the first complete year under the preference, will not be available for some months. Taking then the figures for 1912, it is shown that in that year the total imports of merchandise of the colonies that are now giving Canada a preference amounted to $44,237,839, while the imports for home consumption in these colonies amounted to $30,365,063, whereas the similar figures for the non-preference colonies were $19,858,144 and $16,013,109, respectively.

Prominence is given to the importance of Trinidad, in regard to which there is noted a remarkable difference between the total imports of that Colony and the imports of merchandise for home consumption, the latter being little more than half of the total imports in 1912. An explanation of this is found in a statement made by Mr. E. H. McCarthy, formerly Collector of Customs of Trinidad, which is quoted in the report, and in which it is pointed out, *inter alia*, that throughout the year trade is carried on by innumerable small craft propelled by sails or paddles, some of which occupy months on the journey to Bolivar. For the whole of the east coast of Venezuela, Trinidad is inevitably the market where European and American goods are bought, and cacao, coffee, cattle, maize and vegetables are sold. Considerable quantities of goods are also transhipped at Trinidad for other islands of the British West Indies, and for British Guiana and South America. British Guiana transhipps and re-exports supplies to Dutch Guiana and French Guiana, while Barbados re-exports considerable quantities of goods to the Windward and Leeward Islands.

The fact that Trinidad, British Guiana and British Honduras occupy geographical positions of such strategic importance commercially that they are distributing centres for adjoining foreign countries, is of importance to Canada, because by having first-class steamship communication with these colonies it is quite probable that Canada may secure a considerable share of the trade of those foreign countries.

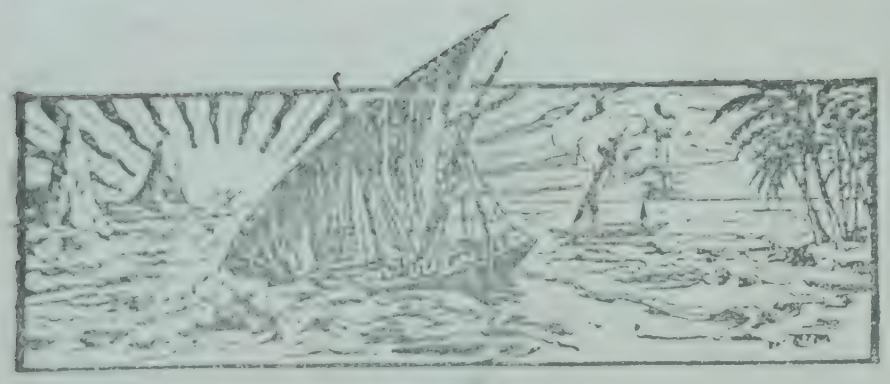
It is interesting to note that the people of the colonies that joined in the Canada-West Indies preferential agreement, spent on imported articles for home consumption the year following the last census, about 27·95 per head of population, while Jamaica and the Bahamas, which have not joined in the preferential agreement, spent about $17·82 per head of population.

THE CULTIVATION OF ONIONS.

The following are the conclusions drawn from six years' experiments with onions in Illinois, dealing particularly with the question of thinning and growing from sets. The information is taken from Bulletin No. 175 of the University of Illinois Agricultural Experiment Station:—

THINNING. The chief objection to thinning onions is the expense. On the other hand, if onions are not thinned, there is likely to be a large percentage of undersized bulbs, and even those that are of marketable size (that is, more than $1\frac{1}{4}$ inches in diameter) are likely to be much smaller than those that have been thinned. The tendency of the market at the present time is to give preference to large-sized onions, so that although the accepted minimum standard size for market onions is $1\frac{1}{4}$ inches in diameter, unless most of the onions in a given lot are considerably above the minimum it is difficult to sell them on some markets, even at a reduced price. Therefore if onions are to be grown without thinning, great care must be taken in sowing the seed to secure a thin and uniform stand. This involves testing the seed for germinative power, and adjusting the seed drill with extreme precision.

GROWING ONIONS FROM SETS. On the whole, it appears that although the cost of growing onions from sets is considerably greater than growing the crop from seed, the sets are more certain than the seed to produce a paying crop, especially under unfavourable weather conditions; the crop is likely to be larger; it ripens earlier, and can usually be disposed of promptly at harvest time. The chief objection to the growing of onions from sets is the enormous amount of labour involved in planting them. However, this is usually offset by the saving of expense in weeding, thinning, and tillage. The excess cost of sets over seed, and the increased labour of harvesting the larger crop from the sets are usually more than balanced by the greater value of the crop; thus, under present conditions, the growing of onions from sets for local market in Illinois towns appears to offer greater opportunity for large profits from small areas than growing onions from seed. The growing of ripe onions from sets may well form part of a general market-gardening business, provided the quantity grown in a given locality does not exceed the capacity of the available markets.



GLEANINGS.

According to a recent issue of the Antigua *Sun*, it has been decided to hold in that Colony a maize show. The exhibition will be opened at the Botanic Station.

The first of the Nigerian Entomological Bulletins has been received, dealing with the general control of pests. This pamphlet is a companion to No. 1 of the Mycological Series already noted in this journal.

An interesting note on the strength of rubber appears in the *India Rubber Journal* for April 3, 1915. It has been shown in America that rubber will stand a greater pressure than the highest grade of steel. Steel pistons with rubber washers were subjected to high pressure and the steel softened, merging into the rubber pores.

A reference to the cultivation of limes in Sierra Leone appears in the *African Mail* for April 2, 1915. This crop grows very well on both the laterite and alluvial soils of that Colony, and it is hoped that in the future an export trade may be developed in limes, which appear to grow as well in Sierra Leone as in the West Indies.

In the *Chamber of Commerce Journal* for April 1915, reference is made to the Philippine plant known as *Blumea balsamifera*, which produces camphor. This plant is a shurb and is one of the most common weeds in the Philippines. It grows to from 5 to 8 feet high and has, it is said, been used for a long time for medicinal purposes in China.

The trade of the Cayman Islands (Dependencies of Jamaica) receives lengthy consideration in the *Financier and Bullionist* for April 10, 1915. Special reference is made to the turtle industry, and it is said that contracts have been made by the representative of a company that contemplates establishing a turtle canning factory in Grand Cayman.

An article entitled 'Manuring Experiments on Castleton Estate' appears in the *Agricultural Bulletin of the Federated Malay States*, Vol. III, No. 3, and although the name of the trees experimented on is not given, it may be assumed that they are Hevea. The results show that none of the various treatments—which included lime—had any noticeable influence on the growth of the trees.

A review appears in the *Bulletin of the Imperial Institute* (October-December 1914) of a recent work entitled 'The Oxford Survey of the British Empire'. In this book three chapters are devoted to the West Indies, including British Guiana. Mr. Aspinall describes the topography, population and government, while Sir Daniel Morris contributes information dealing with geology, climate, vegetation, fauna, and economic conditions.

A note on coco-nuts in the *Journal of the Jamaica Agricultural Society* (March 1915) provides the information that the Society has received seed nuts from a plantation on the Pacific side of Central America which are said to be rapid growers, and it is thought that this is quite likely since some of them had already started to sprout on the journey. These nuts are very round, and on opening them the husk is found to be very thin, and the nuts inside them practically spherical.

In his article on Trinidad birds in the *Bulletin of the Department of Agriculture of Trinidad and Tobago*, May 1914, Mr. P. L. Guppy states that there are 300 species to be found in that Colony. Of land birds alone Trinidad does not possess more than 190 species. Migratory and aquatic birds supply the balance. With a few notable exceptions, birds do not play an important part in keeping down insect pests in Trinidad. The exceptions are given at the beginning of the article. Some of the woodpeckers appear to be especially useful.

The resources and agriculture of South Australia are very adequately described in the Handbook issued by the Intelligence and Tourists Bureau at Adelaide. The illustrations, which are numerous and diverse, give an excellent idea of the country and its possibilities, and although the conditions are not tropical, the publication will be interesting reading to those who have a knowledge of agriculture of any kind. One interesting fact noted is that loans are granted to agriculturists for the purchase of wire netting to be erected as a protection of crops against rabbits, wild dogs, and other vermin. This loan system has proved highly satisfactory.

In *Nature* for March 25, 1915, an article is reviewed dealing with observations made on the relation between soil moisture and plant associations in America. The term 'growth-water' is introduced by the author of the article for the percentage of soil moisture in excess of that found by experiment to be present in the soil when wilting occurs in plants; and it has been found that the differences in the ratio between evaporation and growth-water in the series of plant communities investigated are sufficient to be regarded as efficient factors in bringing about the succession of gradual changes from the scanty drought-vegetation of the open sand to the moisture-loving broad-leaved forest, which forms the climax of the series.

An interesting study of the inheritance of fertility is noted in *Nature* for April 8, 1915. At the University of Illinois two distinct species of animals have been crossed, the wild Brazilian cavy (*Cavia rufesens*) with the sharply distinct common domestic guinea-pig (*C. porcellus*). In this experiment between *C. rufesens* males and *C. porcellus* females gave completely sterile male and fertile female hybrids. By mating the female hybrids with *C. porcellus* males, quarter-wild hybrids were obtained, again sterile males and fertile females; but by repeated back crosses of female hybrids to *C. porcellus* males, individuals with increasing fertility were obtained. Fertility seemed to act like a very complex character; for the results obtained where what one would expect if a number of dominant factors for sterility were involved, the elimination of which would get a recessive fertile type.

STUDENTS' CORNER.

NOTES ON EDUCATION IN DEMERARA AND ABROAD.

The contents of an important Combined Court paper is reviewed in the Demerara *Daily Chronicle* (March 5, 1915). In this it is notified that the post of Science Lecturer in the Department of Science and Agriculture is to be abolished and that of Assistant Master at Queen's College substituted. It is understood that this Assistant Master will be in charge of the science teaching at the College, and it has been suggested that the second Assistant Analyst of the Department of Agriculture should be appointed to a new post known as Scientific Assistant. The duties of this office are to include the editing of the *Journal of the Board of Agriculture* and the demonstration of chemistry at Queen's College.

The changes referred to are the result of the necessity to curtail expenditure, but it is wisely advocated by the Director of Science and Agriculture and supported by the Principal of Queen's College that scientific and agricultural education should not be allowed to suffer. Indeed the proposal is made that the Scholarship in Classics should be dropped and only Science and Mathematics continued. This suggestion is based upon the circumstance that all three cannot be continued, and the additional fact that Science and Mathematics are the more important from the point of view of the development of the Colony.

The above is interesting as an indication of the attitude of public opinion in a large colony towards science.

Turning to recent news concerning less advanced agricultural education, the student may be interested to learn of the success obtained in North America regarding school garden clubs. We have referred from time to time to the corn and pig clubs in the United States, but the *Agricultural Gazette* of Canada for March 1915 describes a children's garden club oganized to teach agricultural co-operation. This club is organized on the same basis as the Farmers' Clubs. Very successful work has been done, especially in poultry raising. The children are taught to help one another, and shown the advantages of a well balanced system of borrowing and lending. It is a mistake to condemn the habit of borrowing, provided the motive is a good one, and provided the borrower is in a position to make an equivalent return for the benefits received.

Much progress has been made with rural education in England of recent years. The Board of Education of that country has just issued a pamphlet in which the teaching of nature study and gardening at the Knaresborough Rural Secondary School is described. A four-years' course is provided. The first two years' work consists in the study of elementary botany; in the third year the soil comes under consideration, and a careful examination is made of the soil and subsoil of the school garden. In the third and fourth years economic plants are studied and a certain amount of work done in entomology and mycology. Throughout the course excursions are made at intervals. In addition to the ordinary 'nature study' walks, visits are paid to farms and gardens and the senior boys attend ploughing matches and agricultural shows.

It will serve a useful purpose if the West Indian student considers these matters in relation to his local conditions of study. One of the necessary things is to realize the importance of agricultural education, and to keep in touch with what others are doing. Much success has attended educational efforts in the West Indies, the evidence of this being not so much because one can point to individual instances, but because there is a better general understanding of agricultural matters. For example, articles dealing with various branches of agricultural science are better understood now than they were ten years ago.

REPORT ON THE EXPERIMENT STATION, TORTOLA, FOR THE QUARTER ENDED MARCH 1915.

Although the gardening work was seriously impeded by the limited rainfall, a considerable amount of nursery work was done during the early part of the period, and consisted principally in the distribution of coco-nut and onion plants. According to the writer of the Report (Mr. G. A. Gomes, Acting Curator) the laying out, planting and clearing of onion plots received special attention during the quarter, and the early planted onions have given good results, while the late planted succumbed during the dry weather. Efforts have been made during the season to organize an Onion Association and it is satisfactory to be able to state that co-operative business between the peasantry and the Station has already been initiated. During the quarter, 24 crates of onions were shipped some of which were received from the peasantry. The co-operative side of the agricultural work in the Presidency was advanced by a visit from Dr. Tempany, who in the course of his inspection laid stress upon the value of co-operation in the production of onions and Indian corn.

Some interesting information is included in the report with regard to cotton. It is satisfactory to learn that all the old cotton plants were destroyed during the quarter. The selected cotton plots, only recently established in Tortola, have given excellent returns in spite of bad weather conditions, some of the strains yielding over 1,000 lb. of seed-cotton per acre. The object in view is to produce sufficient selected cotton under government control in order to render unnecessary the importation of diverse kinds of seed for planting from other islands. The Cotton Factory contiuned to purchase seed-cotton during the quarter, but the growers have suffered to some extent through boll dropping, and felt some anxiety concerning market conditions in England which, however, since the writing of the report, has been dispelled on account of the changed conditions resulting from the Fine Spinners' guarantee of a minimum price.

Much satisfaction is expressed with regard to the coco-nut demonstration plots. The plants have withstood the dry months remarkably well, and in plot 1 the trees, which are now only a little over a year old, have in many cases reached a height of over 8 feet.

The trees have received attention in regard to the treatment of scale insects and have been manured, and catch crops have been planted.

Brief reference is made to limes and bay trees: the former. which are receiving manurial treatments, are said to be yielding interesting results; the latter are making slow growth, but more could not be expected in view of the very dry weather conditions that were experienced.

FUNGUS NOTES.

PRELIMINARY NOTE ON A DISEASE OF CARICA PAPAYA.

Opportunities have recently occurred of examining specimens exhibiting what appears to be a well-marked disease of the papaw tree.

The writer has seen from time to time in Barbados instances of a localised stem rot of the papaw. A widening depression or shrinkage is produced, the wound becomes infested with bacteria and with fly and beetle larvae, and usually leads to the falling over of the top.

A young tree which recently became diseased in the garden of the Commissioner of Agriculture afforded an example of a fairly advanced stage of what appeared to be the same affection.

In a region of the stem situated at about three-quarters of its total height above the ground, just at the base of its green portion, there occurred a browning of the tissues, accompanied by a very distinct shrinkage in the circumference of some 6 or 8 inches of its length. The leaves showed signs of f. ling, and had extensive dead and browned areas. A fully grown but unripened fruit had a diseased area on one side. The small, closely grouped pustules of a fungus were found abundantly in connexion with each of these lesions. On the leaves the pustules were surrounded by black bristles, and were those of a typical Colletotrichum, on the stem and fruit the bristles were absent. The spores were identical in form and origin in all three situations. Typical examples measured 16-17·5 by 4·1-4·8 microns. The absence in particular circumstances of the characteristic bristles is familiar amongst species of Colletotrichum, and does not reduce the probability of the identity of the form found on the stem and fruit with that on the leaves.

In August 1914 Mr. W. Robson, Curator of the Botanic Station, Montserrat, forwarded for examination specimens of diseased papaw fruits and stems, reporting that the disease had been noticed on papaws in Montserrat for a considerable time, but was particularly prevalent at the time of writing in the neighbourhood of Plymouth. He went on to say that the disease appears to commence on the fruit as a water-soaked area which after a time becomes sunken and later blackens: ultimately the fruit rots altogether. The disease on the stems also commences as a water-soaked area. In some cases the stem is entirely girdled and the top breaks off; other cases recover to a great extent.

The stem material sent was not in good condition, being old; the only fungus detected was a species of Phoma. A later consignment, consisting of several examples of early water-soaked lesions, some only just beginning, showed throughout a fungus apparently identical with that on the Barbados specimens. Satisfactory material of the fruit disease has not yet been received from Montserrat.

Pustules of a Colletotrichum, which is probably the same species, have been observed to be common on the petioles of the old and dying leaves of healthy trees. Tests of the degree of parasitism of the fungus and of the identity of the two forms are projected.

W.N.

DISEASES OF CASSAVA IN TRINIDAD.

Amongst a collection of papers on cassava printed in the Bulletin of the Department of Agriculture, Trinidad, Part 2 1915, occurs an account of the fungous diseases of that plant by Mr. J. B. Rorer.

The author states that in Trinidad cassava has been remarkably free from such troubles, presumably because the plant has been grown only in a discontinuous fashion. The adoption of cassava as a regular crop owing to the demand from the three factories now at work in the island will doubtless give greater opportunities for diseases to assert themselves.

The only diseases mentioned as occurring in Trinidad are two leaf spot affections. One of these, in which the spots are only $\frac{1}{16}$ to $\frac{1}{8}$-inch in diameter, white in colour, and surrounded by a brown or purple border, does little damage. The other, which produces brown spots $\frac{1}{4}$ to $\frac{1}{2}$-inch in diameter, often so numerous that they coalesce, may destroy a considerable area of leaf, and causes many leaves to fall prematurely. A spraying experiment is being carried out in order to ascertain the amount of economic loss, if any, preventible by this means.

Reference is made to diseases occurring on cassava in other parts of the Tropics. These include leaf spots due to *Cercospora* spp., leaf and stem diseases due to *Gloeosporium manihotii*, and a stem disease due to *Bacillus manihotus*.

To this it may be added that in the Lesser Antilles cassava is liable to be attacked and killed by the Rosellinia root disease of cacao when planted as a cover crop on areas from which the trees have died from this cause, and that a Gloeosporium die-back and a bacterial leaf disease occur in Barbados.

ROOT DISEASES IN MALAYA.

Two root diseases of Hevea in the Malay States are the subject of articles by Mr. F. T. Brooks in the *Agricultural Bulletin*, Vol. III, Nos. 2 and 3.

The disease caused by *Sphaerostilbe repens* is of interest in the West Indies because of the attribution of the red root disease of limes in Dominica to a member of the same genus. The disease as it occurs in Ceylon has been already described by Mr. T. Petch.

The progress of the disease is slow. Its effects are seen above ground in the thinning of the foliage and the gradual dying back of the branches. There is no external mycelium, but characteristic flat strands occur between the bark and the wood of the roots. They are about $\frac{1}{8}$-inch across and vary from grey to dark-brown or black. The finer mycelium permeates all parts of the bark and wood of the affected organs. The disease progresses from the lateral roots to the collar, and may ascend some distance up the trunk. Fine trees fifteen to twenty years old are affected, as well as younger specimens. The distribution is usually a scattered one.

The fungus exists as a saprophyte on dead material, but in the diseased trees it is found advancing into living tissues and therefore acting as a parasite. The means and conditions of infection are not known. Attempts to infect trees with pure cultures have been unsuccessful.

The usual methods of dealing with root diseases are recommended.

The second disease has not been previously recorded in Malaya, and the causative fungus has not been identified with certainty. It is similar to, and possibly identical with, *Ustulina zonata*, which, as in the case of the fungus mentioned above, has already been described by Petch as giving rise to a disease of Hevea and other plants in Ceylon.

The collar is the part of the tree principally affected. The fruit-bodies are plate-like in form, greyish brown in

colour, except at the growing margin which is greenish, and are marked by an irregular and obscurely zoned surface. The substance of the fruit-body is brittle when mature. The plate-like fructification is several inches across when fully developed, and the shape is irregular. It grows closely adpressed to the diseased collar of the tree or an exposed lateral root.'

Young plants have been killed by inoculation of the roots with the fungus from pure cultures.

Excision of affected tissues may be successful in dealing with early stages of the disease; for advanced cases there is no hope of cure. The fungus chiefly affects the older trees, and some of the finest specimens fourteen to sixteen years of age have been killed by it.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of March:—

In reviewing the trade of the month of March we have to take into consideration the transactions of five weeks, as compared with those of the usual four weeks, the first drug auction having been held on the 4th of the month and the last on the 31st.

At the beginning of March there was a slight decline in the activity that prevailed in Feburary, but nevertheless a fair amount of business was transacted as the month advanced, but with a decided upward tendency in values, as for instance in ginger, West Indian lime oil, Pimento, and some others.

The more noticeable advances have been, of course, in the synthetic productions hitherto furnished by Germany, but which are now becoming scarce or are not yet fully supplied from other sources. The following are some details affecting West Indian products:—

GINGER.

At the first spice auction on the 3rd of the month, ginger was in very fair demand; brown rough wormy Calicut was bought in at 25*s.*, rough washed Cochin at 27*s.*, and wormy at 25*s.* per cwt. The quotations for Jamaica privately were 38*s.* to 46*s.* for common to medium, and 50*s.* to 55*s.* for good. Towards the end of the month the quotations advanced to 55*s.* to 60*s.* for good and 45*s.* to 50*s.* for common to medium; Cochin was quoted at from 26*s.* to 27*s.*, new crops fetching 28*s.* and Calicut 27*s.* Quite at the end of the month the rates advanced to 53*s.* to 55*s.* for common to small Jamaica, and 60*s.* to 65*s.* for good, while good washed Cochin was quoted at 28*s.* to 28*s.* 6*d.*

NUTMEGS AND MACE.

Of nutmegs and mace there has been very little doing during the month. At auction on the 3rd, 166 cases of limed Java nutmegs were sold and 24 packages of West Indian, all at steady rates; at the same auction 6 packages of West Indian mace were brought forward and sold at 1*s.* 8*d.* per ℔. for reddish, being 1*d.* per ℔. advance on previous rates. In the middle of the month Pimento was quoted at $2\frac{1}{4}d.$ per ℔., being also a slight advance. At the close of the month fair manufacturing St. Vincent arrowroot was quoted at from 2*s.* $\frac{1}{4}d.$ to 2*s.* $\frac{1}{2}d.$, and good at 4*s.* $\frac{1}{4}d.$ per ℔.

SARSAPARILLA.

At auction on the 18th, sarsaparilla was in good supply and fair demand; of grey Jamaica 12 bales were offered, all of which were disposed of at 1*s.* 11*d.* to 2*s.* per ℔. for slightly coarse to good fibrous, and 1*s.* 10*d.* for coarse; of 19 bales of Lima-Jamaica brought forward 12 were sold at 1*s.* 8*d.* per ℔., and for 9 bales out of 13 offered of native Jamaica a few bales realized 1*s.* per ℔. and the rest 11*d.* per ℔.

CITRIC ACID, LIME JUICE, LIME OIL, CASSIA FISTULA, AND KOLA.

The month commenced with a steady demand for citric acid at 2*s.* 6*d.* per ℔., a price that was fully maintained to the end. Lime juice has been very scarce, practically, in the early part of the month none was to be had. At auction on the 17th, 4 puncheons were offered and 3 sold at 2*s.* 1*d.* per gallon for fair pulpy. It was reported that good Jamaica was worth 3*s.* per gallon and Dominica 2*s.* 9*d.* Lime oil has been both scarce and dear, 3*s.* per ℔. being asked for West Indian distilled, and 6*s.* 6*d.* for hand pressed. At the drug auction on the 18th, 20 packages of Cassia Fistula pods were offered and only 5 sold at 27*s.* 6*d.* per cwt. for lean pods. At the same sale 8 packages of kola nuts were brought forward and 5 sold at $3\frac{1}{4}d.$ to $3\frac{1}{2}d.$ per ℔.

Self-burning Limestone in Syria.—In the district of Hauran, a volcanic district of Syria, south of Damascus, east of the Upper Jordan, a curious stone is found which might be described as a 'self-burning limestone'. At this place the rock lies in a stratum between ordinary limestone; it is of a greyish-black colour, and when freshly broken it has an odour of petroleum. The quarrying, according to the American Deputy-Consul at Jerusalem, who has lately visited the district, is easily done with primitive picks and other tools, as the rock is quite soft and full of seams. The stone is broken into small pieces with hammers and piled up against the bank of rock. A wall of the same material about 2 feet high is roughly laid up round the pile on three sides, making a pile of small stones 8 to 10 feet long, and nearly as wide, and 2 feet at the front, rising to nearly three times that height at the back where it lies against the bank. In building the wall around the pile small holes are left in which to start the fire.

When the kiln is ready to burn, a few small bunches of straw are placed in the holes mentioned, lit with a flint and steel, and in a short time the whole pile has ignited. The men then begin working on a new kiln while the other burns and cools. After about twelve hours of burning the stone has all become converted into lime, except the stones in the wall and the very top layer, which are only about half burned. When cool the lime is air-slaked and sifted to remove any pieces not thoroughly burned, which are thrown into a new pile to be fired again. The lime is white and said to make a very strong plaster, superior to the ordinary lime burned with brush, but sells at a much lower figure because of the low cost of production. (*Journal of the Royal Society of Arts*, February 26, 1915.)

MARKET REPORTS.

London.—The West India Committee Circular, April 6, 1915.

Arrowroot—2⅛*d.* to 2 $^{9}/_{16}$*d.*
Balata—Sheet, 2/2; block, 1/11¼ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 98/- per cwt.; Grenada, 89/- to 96/6; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £26 10*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 18*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, £21; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations
Mace—1/4*d.* to 2/11*d.*
Nutmegs—4¼*d.* to 5¾*d.*
Pimento—Quiet.
Rubber—Para, fine hard, 2/5½; fine soft, 2/3¾; Castilloa, 1/7 to 2/-.
Rum—Jamaica, 3/ to 4/

New York.—Messrs. Gillespie Bros., & Co., May 1, 1915.

Cacao—Caracas, 16¾c. to 17c.; Grenada, 17c. to 17¼c.; Trinidad, 17¾c. to 17c.; Jamaica, 15½c. to 16c.
Coco-nuts—Jamaica $25·00 to $26·00; Trinidad, selects, $26·00 to $27·00; culls, $15·00 to $16·00.
Coffee—Jamaica, 8¼c. to 8½c. per lb.
Ginger—9¾c. to 12c. per lb.
Goat Skins—Jamaica, 43c.; Antigua and Barbados, 41c. to 43c.; St. Thomas and St. Kitts, 38c. to 41c. per lb.
Grape Fruit—Jamaica, $1·50 to $2·00.
Limes.—$7·50 to $8·00.
Mace—48c. to 55c. per lb.
Nutmegs—11c. to 12c.
Oranges—Jamaica, $1·50 to $1·75.
Pimento—3¾c. per lb.
Sugar—Centrifugals, 96°, 4·83c.; Muscovados, 89°, 4·20c.; Molasses, 89 , 4·06c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 17, 1915.

Cacao—Venezuelan, no quotations; Trinidad, $19·92 to $20·16.
Coco-nut Oil—75c. per Imperial gallon.
Coffee—Venezuelan, 11c. per lb.
Copra—$4·00 to $4·25 per 100 lb.
Dhal—$7·50.
Onions—$4·00 per 100 lb.
Peas, Split—$12·00 per bag.
Potatoes—English $2·25 to $2·50 per 100 lb.
Rice—Yellow, $6·00 to $6·25; White, $7·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. T. S. Garraway & Co., May 3, 1915.

Arrowroot—$4·00 to $4·50 per 100 lb.
Cacao—$13·00 to $14·31 per 100 lb.
Coco-nuts—$16·00.
Hay—$1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $82·00 per ton.
Molasses—No quotations.
Onions—$5·67 per 190 lb.
Peas, Split—No quotations; Canada, $5·85.
Potatoes—Nova Scotia, $2·75 per 160 lb.
Rice—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, no quotations.

British Guiana.—Messrs. Wieting & Richter, May 1, 1915; Messrs. Sandbach, Parker & Co., April 30, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	$10·00
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	15c. per lb.	16c. per lb.
Cassava—	96c. to $1·20	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$20 per M.
Coffee—Creole	——	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	——
Liberian	10c. per lb.	13c. per lb.
Dhal—	——	$8·25 per bag of 168 lb.
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	5c. per lb.
Madeira	——	——
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·50	$2·75
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·68	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
Tannias—	$2·88	——
Yams—White	——	——
Buck	$2·64	——
Sugar—Dark crystals	$3·50 to $3·60	$3·75
Yellow	$4·00 to $4·10	$4·25
White	——	——
Molasses	$3·10 to $3·25	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

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Development of West Indian Fisheries.

FOURTEEN years ago, at the Third West Indian Agricultural Conference, held at Barbados, Dr. J. E. Duerdon, of the Jamaica Institute, brought up the question of developing the marine resources of these islands. In the course of an interesting paper he showed how great are the potentialities of the surrounding seas, and indicated that their development should yield results of proportionate value to the improvements and successes obtained in regard to agriculture. Dr. Duerdon, as a marine biologist, was able to include in his paper a large amount of technical information and practical suggestions, and those readers who are interested in the subject under discussion will find the article instructive.*

It is indeed deplorable that with the exceptions of Jamaica and the Bahamas (of which the latter are not strictly speaking West Indian), no systematic effort has been made by the British West Indian Islands in the direction indicated. In the case of agriculture, departments have arisen, societies and boards have been established, outside enterprise has brought capital and men, an extensive literature has grown up—in fact the land has monopolised attention. The development of the marine resources has been left entirely to the labouring classes who earn from them a scanty livelihood, and to certain individual observers who have conducted very estimable enquiries, but only as amateurs.

Before attempting to make suggestions as to the ways and means of development, we may consider briefly what constitute the present marine industries. Around most of the islands line fishing for snapper, bream, and dolphin is carried on to meet as far as possible the daily demand, but Barbados is of course renowned for its flying fish industry. Coming within the category of 'fish' in the popular sense are sea-eggs, oysters, lobsters, and crabs. The sea-egg industry is principally, though not necessarily, confined to Barbados; oysters are raised in Jamaica and Trinidad on a considerable scale, and lobsters and crabs are caught on the reefs around most of the islands. One of the most important industries from the point of view of export is turtle fishing, which has its centre at Jamaica. The value of the turtles exported is considerable, and it is one of the few industries that

*See *West Indian Bulletin*, Vol. II (1901).

the Governments have attempted to encourage. As regards possible marine industries which have not yet become established, we may mention the cultivation of sponges and pearl oysters. It is probable that many of the lagoons around islands like Barbuda and Antigua, which are at present yielding nothing, could eventually be made important sources of profit and revenue by the introduction of these new industries. It may be mentioned at this juncture that the Imperial Department of Agriculture is collecting available information of local bearing on this subject, and an article dealing with the matter in detail will appear shortly in the *West Indian Bulletin.*

In endeavouring to develop West Indian fisheries there are two main lines of effort which might be followed up: First the establishment of central organizing bodies to deal with practical matters such as the best methods of capturing and curing tropical fish, marketing, and the encouragement of enterprise in fishing generally: these would correspondent to agricultural societies; and secondly, a marine biological laboratory, or a Department of Fisheries for the investigation of life-histories, artificial curing, re-stocking of exhausted grounds, surveys—all parallel lines of investigation to those carried on in Agricultural Departments. As the combined result of these two lines of activity, West Indian fishing would be raised from a desultory occupation to an organized industry. The educational influence of societies, and a research institute would be important features of the movement. In this connexion lectures and demonstrations would be of value, and the distribution of printed information might also serve a useful purpose. Furthermore, a marine bias might be given to the teaching in the elementary schools in certain districts, for instance, on the Windward side of Barbados, where many of the population are dependent on the sea rather than on the land for their livelihood.

A good example of what marine investigation can do is afforded by the case of Porto Rico. Scarcely had this neighbouring island passed under American control before the United States Fishery Commission despatched the steamer 'Fish Hawk' to investigate the possibilities of the surrounding waters, and the elaborate memoir which was published contains exact descriptions of the different species, notes on life-histories, and other information of great importance. The Danish Government has also displayed interest in West Indian fisheries, and an investigation into the habits of turtles is now being conducted at considerable expense. In the British islands, other than Jamaica, Government action has been confined almost entirely to the passing of legislation in regard to close seasons, etc., and notwithstanding the usefulness of this action, it cannot be regarded as sufficiently adequate.

In concluding this article it is perhaps well to emphasize the fact that it is our present policy to advocate fishery development more especially in islands which are unsuitable for agricultural pursuits. It is desirable as well, however, to utilize to the full such resources as exist even in places where agriculture flourishes, and there is no doubt that the application of science and co-operative methods would lead to important economic developments. The export of turtle, canned fish, and sponges might constitute a source of revenue, and the increased production of fresh fish would tend to lessen the large quantity of salt fish annually imported from North America. Ceylon has its pearl oyster beds: this valuable industry which yields millions of dollars of pearls annually has on several occasions been suggested and, in theory, shown to be suitable for certain parts of the West Indies; but a beginning has not been made because there is no central institution which has the requisite information and experience to show how to make a start.

SUGAR INDUSTRY.

WATER-SUPPLY IN TROPICAL SUGAR FACTORIES.

Many sugar factories have an adequate supply of clean water from rivers and other convenient sources, but a larger number are at times, if not always, short of this necessary element and are driven to expensive expedients in the way of wells and pumping plants to secure it. Many factories have no doubt found the way out on plans similar to the one outlined in the present article, but there is still a large number of ingenios which are needlessly troubled for lack of enough water by failure to realize that each day's cane brings a copious intake of water, already bought, paid for and delivered.

This source of water is generally neglected because it is allowed to trickle to waste from so many places that its actual quantity is not realized: or, if appreciated, it is so often contaminated with cylinder oil and sugar that it is unfit for use; but with reasonable care to keep it clean and to save it systematically, it can be made a highly valuable asset and an important economy.

It is impossible to arrive at an accurate estimate of the waste of water in any factory, because the leakages are variable and of very many sorts, and the figures given are to be regarded merely as rough approximations, which will differ widely at even the same factory at different times, but most of them can be reduced to a minimum by prevention of leaky steam joints and water piping, and remedy of the causes leading to the carrying over of sugar in condensation for

heating coils and calandrias, and from vacuum pan and evaporator condensers, as well as securing overflows from water tanks which will take the excess back into the general water-supply.

A certain unavoidable loss of water will always exist, due to escape of excess steam from boiler safety valves and blowoffs, and from the relief valve on the exhaust steam recipient, while washing of filter cloths, general cleaning up and water used for boiling out pans and evaporators will remove another portion from the stock, and in addition to this are the losses due to evaporation from water tanks, flashing from steam traps, and evaporation and wind entrainment from the cooling tower.

In evaporating juice from 18 degrees to 95 degrees Brix, to take an average case in Cuba, there will be a product of water amounting to 81 per cent. of the weight of original juice. Assuming that the mill is extracting the low yield of 75 per cent. juice on cane weight, this will be a quantity of 60 lb. water 100 lb. of cane; or per thousand Spanish tons (2,500 lb.), a volume of about 180,000 gallons daily in a house grinding the tonnage named.

The disappearance of water from stock in the factory should not exceed a total of 43 per cent. of the amount received from the cane, and will be distributed about as follows:—

Steam leaks, boiler blowoff and excess exhaust from escape	5	per cent.
Accident, overflows, sugar in water, etc.	10	,, ,,
Washing machine, general cleaning	15	,, ,,
Evaporation leakage and wind losses at cooling tower	13	,, ,,
	43	per cent.

Leaving 57 per cent. of the water received in excess over the consumption and loss in the factory, or an available quantity of about 102,000 gallons.

About one-third of this total excess water can be regarded as wasted, as it passes into the circulation water of the cooling tower by way of the condensers, and the circulation supply cannot be safely used for general sugar mill purposes. This one-third disappears as overflow from the cooling tower basin.

There are then left about 68,000 gallons of pure water which, if care is taken in the factory in the ways indicated earlier, will overflow from the boiler feed tanks and can be saved and retained in quantity for all emergencies and uses, among which is the important one of holding a supply large enough to change the entire contents of the cooling tower basin and circuit at frequent intervals, to keep it fresh and avert corrosion of piping due to acidity of this water caused by the small trace of sugar which it will always carry under the best of conditions, and which forms various acids under fermentation and other changes.

It is the usual practice to add to the condensed water in the boiler feed tanks a small and continuous feed of natural water, in order to prevent the harmful action which pure distilled water has on boiler tubes and plates. This addition of outside water can be omitted if thin lime milk is arranged to drip into the feed-water tanks so that a quantity of dry lime equal to about 1 lb. per 5,000 gallons of water will be maintained. Acidity will not occur, and the water will acquire a safe degree of hardness without forming too much scale.

In a factory handling 1,000 tons cane daily, a fair allowance of water for the cooling tower and the filled circulation would be about 150,000 gallons. With proper precautions taken to keep the condensation free of sugar and oil, and to save all leakage that can be prevented, and bringing to the feed-water tanks all of it that can be saved, the overflow from these tanks can be diverted into a concrete basin, or main reservoir, and held there in ready condition for all of the factory service where water is not wanted actually hot, the latter being taken direct from the feed-water by a special service pump.

Such a reservoir should be located near to the cooling tower basin, but not where spray from the latter will be blown into it. It should carry about twice as much as the volume in circulation and in the basin, or, say, 250,000 to 300,000 gallons, with its bottom about the same level as the bottom of the cooling tower basin, and with walls twice the height of those of the basin. This will permit of emptying out the basin once or twice a week, and refilling it from the reservoir by a 10-inch or 12-inch connecting pipe, without stopping the mill or interfering with the work in any way, if the basin outlet is opened and the contents run off to a minimum working level, and the pipe from the reservoir then opened full while the drainage from the basin is closed.

The general supply of water for the factory will be drawn from the main reservoir and will be always plentiful and cool enough for all purposes. All condensation lines leading to the boiler feed tanks are to be provided with means for turning out water if it becomes charged with sugar, until the trouble is corrected, and should be brought to some single point where the stream from each of these lines will be in plain sight and easy of access for examination.

It is not the intention of this article to go into the question of what sort of cooling tower is best to use. There are several types of cooling apparatus, and any one is good which will expose enough water surface to the air for a long enough time, and which has a catch basin wide enough to prevent excessive wind loss of the cooled water. (*Louisiana Planter*, April 24, 1915.)

Radio-Active Manures.—The *Journal of the Board of Agriculture* (England) for April 1915, gives the following summary of United States Department of Agriculture Bulletin No. 149, which deals with radio-active substances as fertilizers:—

'The properties of radio-elements and the influence of radio-active rays on plants are discussed. The experiments in England by Hedworth Foulkes, on the Continent by Malpeaux, Berthault and Bretigniere (see this Journal, July 1913, p. 324), and in Australia by Ewart, are reviewed and reference is made to the question of catalytic manures.

'The conclusion is reached that it seems incredible that radium or any of its products can have any economical application as a fertilizer in general farming; and still less credible that the so-called radio-active manure has any value, as far as its radio-activity is concerned, since the radium already present, on an average, in an acre-foot of soil, is about 100 times greater than is contained in the quantity of radio-active manure commonly recommended for application to an acre.

'It is thought, however, that radio elements may prove of considerable value, justifying the expense involved in botanical research, and possibly also in greenhouse work.

'Evidence is given to show that the action of uranium on plants is due to its chemical properties rather than to its property of being radio-active, and that the conflicting results obtained with radio-active manure from different sources is to be explained largely by the presence of uranium, and of such non-radio-active constituents as soluble salts and free acids.'

CITRUS FRUITS.

CITRUS FRUITS IN THE PHILIPPINES.

A very interesting article appears in the *Philippine Agricultural Review*, Vol. VIII, No. 1, in which are described the different kinds of citrus fruits cultivated and growing wild in the Philippines. None of the species are indigenous, but several of them are believed to be new to science, while others are so distinctive as to warrant wider appreciation of their characteristics.

In discussing the economic value of the new or little-known species, the following observations are made:—

Briefly stated, it may be said that the 'Tizon' is a dessert or breakfast fruit of high, if not perhaps the highest, order, its main defect being the unsightly basal projection. Then, as stated elsewhere, the best 'limon real' is unsurpassed in quality for 'ade' making. Perhaps third in importance are the better types of the alsem for the manufacture of citric acid, etc., and it might find a sale in competition with the lemon and lime, depending to a great extent upon its keeping qualities. The juicy, thin-skinned, and few-seeded talamisan may find lovers as a breakfast fruit, and is also of the right size for an ade fruit. If cultivation would increase the juiciness of the panuban, this fruit may find favour with many. A good marmalade may be made of the calamondin. The above species or varieties have more or less of a future on account of their pomological merits, and the plant breeder, by crossing them and the cabuyao and canci with old cultivated species, might obtain valuable results.

There is also the prospective value of the new species as stocks. To determine the cogeniality of these species and the old cultivated citrus fruits and their value as stocks under various soil conditions would of course require the labour and close observation of many years.

The calamondin is quite drought-resistant and would probably dwarf the scion. One-year-old buds of the pomelo, lime, madarin and orange at Lamao have made satisfactory growth, the buds taking without difficulty. The cabuyao is a very vigorous tree and is also drought-resistant. It has recently been budded with the cultivation citrus fruits, the buds 'taking' very well. The orange has been budded on the alsem, resulting in a good growth, being now (December 1914) nine months old. During the trip to Bohol in May, the limao, growing in a coraline limestone formation overlaid with a little humus, the exact counterpart of the Bahama Islands or the 'hammock lands' in south-east Florida, impressed the writer as one of the best examples of drought resistance among citrus fruits under such conditions. The talamisan also appeared quite drought-resistant, and is furthermore of value as a live fence because of its large spines.

The 'limon real' is of great vigour and hence may be a desirable stock for certain varieties and under certain conditions.

CITRUS CULTURE IN NEW SOUTH WALES.

A remarkably useful bulletin (No. 90) has been issued by the Department of Agriculture of New South Wales with the object of extending the area under oranges and lemons in a suitable district of the State. In regard to the soil, the budding, planting, manuring, the different varieties are described and illustrated with a series of excellent photographs. That part of the bulletin dealing with lemon cultivation is especially interesting, particularly the section describing the methods of handling lemons in Italy. The methods used in the gardens and packing houses are described, as well as the curing and the treatment of summer crop lemons. The bulletin concludes with notes on the manufacture of candied peel, and the different insect pests associated with oranges and lemons.

THE LIME AND THE LEMON COMPARED.

The following are the conclusions appended to an article by Mr. W. R. Dunlop on the lime and the lemon as sources of citric acid and essential oils, in the *Bulletin of the Imperial Institute*, Vol. XIII, No. 1 (January-March 1915):—

(1) The output of lime products in the tropics, although comparatively small, is rapidly increasing. The Sicilian production of lemons is, on the other hand, stationary, but according to the demand of the world's market, this country can increase her output of citrate at the expense of fresh lemons, and vice versa. Lime growers can to a certain extent do the same, but are less able to exert influence in this respect.

(2) An examination of figures relating to the composition of the lemon and lime shows that the lime is richer in juice and citric acid than the lemon. But the lemon generally contains more essential oil.

(3) As regards cultivation the two crops differ in many respects. Lemon cultivation seems the more expensive owing to the necessity for irrigation, frost protection, and handling, but lemon products can be placed on the European market at less expense than lime products.

(4) For purposes of comparison the lemon may be regarded as yielding 634 lb. of citric acid per acre against 914 lb. in the case of limes. The figures for essential oils are 88 lb. and 65 lb., respectively.

(5) In view of the probable increase in the Sicilian output of citrate, lime growers might with advantage increase their shipments of concentrated juice of uniform density (about 100 oz. of citric acid per gallon). Only raw lime juice of the best quality should be shipped. Since lime oils are used for different purposes from lemon oils, they cannot be said to come into direct competition unless the qualities of one are so inferior as to permit of the substitution of one by the other. Oils take longer to sell than other citrus products. Lime oils are, on the whole, more variable than lemon oils.

(6) It is not possible on the basis of available information to compare the profits from lemon and lime cultivation. With good prices it is probable that it is greater in the case of limes.

(7) As regards marketing, the existence of the Sicilian Camera means lack of that competition amongst buyers which is enjoyed by the lime-growing industry. At the same time the Camera ensures a minimum price for lemon growers.

(8) The testing of samples is not as satisfactory as it might be. This is said to be largely the result of variation in the composition of juices in individual shipments.

(9) A profitable trade in orange oils might be more generally established in the West Indies.

SWEET POTATO AND COWPEA VINES AS FOOD FOR STOCK.

Some investigations have been made in Japan, and reported on in the *Journal of the Department of Agriculture of Victoria*, which seem to show that the dried vine of the sweet potato affords an excellent fodder for live-stock. In discussing the work it is said that the aggregate weight of stem and leaves per hectare is 13 tons. The green vine is considered rather a watery food resembling in composition the leaves of the sugar beet, containing tannin, however, instead of oxalic acid. Although this green stuff may with caution be fed as such, it is the dried material which has proved more satisfactory. In the experiments, the stems and leaves were exposed to the sun for a few days, but at a temperature much lower than occurs in the tropics, and eventually an air-dried herb was obtained with a fine aroma, which was gladly eaten by stock. The green vines and leaves of the sweet potato were also shown to serve as useful material for the manufacture of ensilage. Animals fed on this material thrived satisfactorily. Although it is observed that there was a loss in nutritive material during its manufacture into ensilage, this amounted only to about 6 per cent.

In another publication (*Tropical Life* for April 1915) attention is given to the value of cowpea vine as a cattle feed. After referring to the great value of this material as a nitrogenous fertilizer and weed destroyer, it is stated that cows getting cowpea hay averaged 1·3 lb. more milk daily than those which were fed on wheat bran. For pig raising it is said that cowpea vines are invaluable. Experiments made in New Zealand with three 50 lb. pigs in a field pasture of cowpeas, given corn additional, and the second lot of three fed on corn only, in a trial lasting forty-two days, showed that the pigs in the cowpea field gained nearly three times as much as those fed on corn alone. In a trial made with this fodder on horses, it was proved that cowpea hay combined with corn and cob meal made a very satisfactory work ration. Cowpea hay with a reasonable quantity of corn is regarded as a good substitute for bran and oats.

HORSE BEAN AS A POULTRY FOOD.

In 1906 an experiment was tried in Dominica to ascertain if the horse bean (*Canavalia ensiformis*) could be used as a poultry food. Twelve chickens, two months old, were individually weighed and placed in two separate runs, six birds being placed in each.

The birds in run A were fed on crushed corn and corn mash, and the birds in run B were fed on horse beans crushed, and as boiled mash.

It was intended to keep the birds thus for four weeks, each bird being carefully weighed at the end of each week. The first day the horse bean was eaten with relish; but on the second day there was much evidence that it was unsuitable food. Two of the birds were quite ill, and the others appeared very shaky. The experiment was therefore concluded and the birds were returned to their former quarters. It would be interesting to know if this ill effect upon the birds was due to any poisonous property, or to indigestibility of the horse bean. It was most probably due to the latter cause. There is reason to believe that much of the suspicion with which the Canavalias are regarded as foodstuffs is unfounded, but careful experiments are needed with different varieties before horse bean meal can be recommended to planters with confidence.

In connexion with this note the reader may be referred to recent information on the same subject in this volume, on pages 136 and 165.

TUBER CUTTINGS VERSUS VINES.

EXPERIMENT IN SWEET POTATO PLANTING.

Towards the beginning of 1914 there appeared in the *Agricultural News* (Vol. XIII, No. 310) an account of an experiment carried out in Montserrat by Mr. W. Robson, the Curator of the Botanic Station, to test the value as planting material of sweet potato cuttings taken from sprouted tubers, as compared with cuttings taken from the vines in the ordinary way. This experiment though showing increased yields in the case of the tuber-planted crop did not indicate the phenomenal difference said to have been obtained in Cuba some few years previously and reported in the *Agricultural News*, Vol. VII, p. 120.

With a view to obtaining more conclusive information, the Montserrat experiments were repeated last year and the results have now been forwarded to this Office by Mr. Robson. In this second experiment the cuttings from tubers and from vines of the same variety were placed in contiguous rows on November 25 and reaped on March 31. With regard to the climatic conditions which prevailed, during the latter half of the period the weather was very dry, the total rainfall from planting to reaping being 12·71 inches, distributed as follows: from November 25·78 inches, December 5·46, January 3·42, February 2·87, March ·18 inch.

Considerable trouble was taken to conduct the experiments in the most careful manner, and the tuber cuttings and vines got an equal start. The results, however, were less conclusive than in the previous year. In the former experiment the percentage gained from tuber cuttings worked out at about 20 per cent., while in this experiment it was only about 9 per cent., with only four of the varieties showing appreciable gains. The variety Red Bourbon, which showed an average gain of 27 per cent. in the first experiment, showed no gain in the present one, but the increase in crop from White Gilkes was as much as before.

It will be seen that on the basis of these two trials it is very difficult, if not impossible to decide whether any particular variety will give an increased yield as the result of either method of planting, and the results must be regarded as disproving the general application of the original Cuban trials in which a gain of 350 per cent. was recorded in the case of the tubers.

It is interesting to note that the Montserrat results indicate that Blue Belle and North No. 3 are good dry weather varieties. Owing to the small rainfall a large proportion of the Red Bourbon and other varieties that usually give the largest crops, yielded in this case potatoes that were small and unshippable.

The practical training for meat inspectors is of great importance. West Indian colonies will be interested to learn something of the course which is given by the Royal Sanitary Institute in England. Morbid conditions of meat are studied, and the signs of health and disease of animals destined for food when alive and after slaughter. The practical methods of stalling and slaughtering of animals are studied and the hygiene of sheds and slaughter houses. Attention is given to legislation and its efficiency. Actual demonstration work has to be done at one of the big slaughter houses. A demonstration of fish inspection is also included. Further information of these matters will be found in the *Veterinary Record* for February 6, 1915.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date May 3, 1915, with reference to the sales of West Indian Sea Island cotton:—

Since our last report a very small business has been done in West Indian Sea Island; the sales amount to about 50 bales, including St. Vincent at 17*d.* and a few small lots of St. Kitts, Montserrat and Nevis 15*d.* to 15½*d.*

Prices remain steady, but in the present state of the war we cannot look for an improved enquiry

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended May 8, is as follows:—

The sales this week consisted of a small lot of Beaufort cotton, and some odd bags classing Fully Fine, leaving in stock only Planters' crops, for which there is some demand, but at prices 1c. to 2c. below the views of Factors.

The buying was on account of the Southern Mills.

There is further demand on account of the Northern Mills who remain unwilling to pay the advance asked.

We quote, viz:—

Extra Fine 25c. to 26c. = 15½*d.* to 16*d.*, c.i.f. & 5 per cent.
Fully Fine 24c. to 25c. = 15*d.* to 15½*d.* " " " "

There is no stock of the lower grades.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, and Manchester, up to May 8, 1915, were 103 and 1,791 bales, respectively.

In connexion with the article we published on the Rhodesian bacon factory, the *Rhodesia Agricultural Journal* for February 1915 reports, that although many of the pigs received at the Company's factory are of first class quality, it is stated that the proportion of pigs which are 'soft' is still very great. Care and attention to modern methods of feeding are necessary if a bacon industry in a warm country is to be a success.

Timehri, the Journal of the Royal Agricultural and Commercial Society of British Guiana (May 1915) contains a very interesting and well illustrated article by His Excellency the Governor (Sir Walter Egerton, K.C.M.G.) on the Railway and Hinterland Development. Another article in this issue deals with the conversion and characteristics of colony timber principally in relation to its utilization in the course of the construction of a railway. It is considered that the sawmill for this purpose should be situated near Georgetown rather than in the interior, and that vertical framed saws driven by a suction gas plant should constitute the plant.

NOTES ON DIRECT SOWING OF SEEDS OF TIMBER TREES IN PLANTATIONS.

Timber trees grown from seeds at the spot where they are to remain will as a rule flourish better, and produce finer timber than those that have been transplanted from nurseries or from the forests, and for this reason, it is recommended that seeds of cedar (*Cedrela odorata*), cypre (*Cordia gerasscanthus*), balsam (*Copaifera officinalis*), and teak (*Tectona grandis*) should be sown at stake or picket. It would, however, be better as a general rule to supply vacancies, due to failure of seeds, with young transplants than to wait another year.

To ensure a good stand, not less than five seeds should be sown at a picket; in the case of balsam, two or three are sufficient, the seeds being evenly distributed round the picket and at about 6 inches from it. When more than one plant results, the surplus can be used as transplants to supply vacancies without injury to the plant left.

The planting spots should be about 2 feet to 30 inches across, and should be cleared of all weeds, and the soil well broken up and made quite fine.

Small seeds, such as cedar and cypre, should be covered with not more than ½-inch of fine soil: balsam and teak may be covered with 1 inch. Seeds should be sown in the position in which they would naturally lie if dropped on the ground.

Sowing is best done after rain, but seeds will keep fresher even in dry weather, if covered with a thin layer of fine soil than if kept in store.

It is of great importance that seeds, with the exception of teak, should be sown when quite fresh. It has been found that 80 per cent. to 95 per cent. of cedar seeds will germinate within a fortnight in moist soil when sown within a month of collection, and 76 per cent. after three months. At six months the seeds are worthless.

Cypre seeds sown at pickets as soon as collected produced 90 per cent. success, and one month after collection, 46 per cent. germinated. At three months old they would probably be useless.

Balsam seeds will keep for two or three months, but give best results when quite fresh.

Teak seeds will as a rule germinate better when one year old than when quite fresh, and it has been found that when sown fresh a far larger proportion grow in the second year than in the year they are sown.

Three or four weeks after the first sowing, if rain has fallen, a second sowing should be made at the pickets at which no plants have grown, to reduce the proportion of transplants necessary. Even in the case of teak, a second sowing is recommended; any surplus plants not required as supplies may be cut out. In dry weather count the weeks from the first rain.

In addition to the re-sowing one or more nurseries should be made in or near the plantation, from which supplies can be obtained as required. These nurseries should be sown at the same time as the plantation. The seeds in the nurseries may be sown two or three together at spots 1 foot apart in rows, the rows being 2 feet apart.

A distance of 10 feet by 10 feet is recommended for a timber plantation, for, although the trees cannot grow to full maturity so close together, they will be forced to form straight trunks, and thinnings can be made as necessary. (*Bulletin of the Department of Agriculture*, Trinidad.)

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. The Superintendent of Agriulture (Mr. J. C. Moore) informs this Office that the cacao fields show a fine appearance for this time of the year and that the nutmeg crops are commencing very satisfactorily. The cacao pickings have been better than last year. In regard to Land Settlement, sixty-nine applications for lots at St. Cyr have been received and sixty-four have been approved. Allotment will take place immediately. During April unusually heavy rainfall occurred in the northern part of the island from the 12th to the 14th inst., causing enormous damage to cultivation, roads and bridges. Two important meetings have been held: one of the Agricultural and Commercial Society at the Botanic Gardens, at which the Superintendent of Agriculture gave a lecture on limes; and the other, a meeting of allotment applicants at St. Cyr. At this meeting there was an attendance of 140, and an address was given by the Agricultural Instructor.

ST. VINCENT. In a communication received from the Agricultural Superintendent (Mr. W. N. Sands) it is mentioned that there will be a reduction in the area planted in cotton and arrowroot, and extensions of corn, beans and peas. Meetings of the Arrowroot Growers' Association and the Agricultural and Commercial Society and Cotton Growers' Association were held on April 28, to discuss high freight rates on cotton and arrowroot. Resolutions were passed suggesting the raising of the minimum price of arrowroot by $\frac{1}{4}d.$ and cotton by $1\frac{1}{2}d.$ per ℔. It is in contemplation to hold meetings in the country districts to stimulate the extension of the areas planted in Indian corn, peas and beans.

ST. LUCIA. Observations relating to staple crops indicate that in the case of cacao, reaping continues, and that in regard to sugar the yields are not as great as expected in several quarters. During April, writes the Agricultural Superintendent (Mr. A. J. Brooks), fourteen days were spent in travelling in the Forestiere coolie settlements and in the Castries and Micoud districts. Account sales received last mail show that the last shipment of lime juice from the Government Factory sold on a £31 basis. This was the lowest price realized during the year. Three casks of concentrated juice were shipped during the month; this closes the crop for 1914-15 and makes a total of 43 casks. In connexion with coming events of interest, it is stated that the Governor (Sir George Haddon-Smith, K.C.M.G.) was expected to pay an official visit to Réunion during the early part of May. His Excellency and Lady Haddon-Smith visited the Botanic Gardens and Lime Juice Factory at Castries during April. The rainfall at the Botanic Gardens for April was 1·83 inches, and at Réunion 7·56.

DOMINICA. It is reported from Dominica that a heavy flowering followed the rains which fell during April, especially on the Leeward coast estates. The local prices for green limes continued at 12*s.* to 15*s.* per barrel, and yellow limes at 5*s.* per barrel; raw lime juice sold at 6*d.* per gallon locally. The annual application of manure to the different plots in the Experiment Stations received close supervision and six additional $\frac{1}{4}$-acre plots were laid out. During the month several gentlemen called at the Gardens; some visited the lime experiment station and others consulted on agricultural matters. At a meeting of the Permanent Exhibitions Committee held on the 22nd, it was resolved that, owing to the war, Dominica would not send an exhibit to the Canadian National Exhibition to be held during 1915. Between April 24 and 26, 10·5 inches of rain was recorded at the Botanic Station; the total rainfall for the month was 15·25 inches; the average rainfall for the month of April over a period of twenty-two years is 2·67 inches.

MONTSERRAT. In his report for April last, Mr. W. Robson, Curator, mentions that a pink-seeded horse bean has been received from the Montserrat Company, which has extra large seeds. Other recent introductions still under trial at the Botanic Gardens are *Tephrosia candida*, Bambarra ground nut, Sudan and Rhodes grasses, white-seeded velvet and fleshy-pod beans, Rouncival cowpeas, and a white corn. The promise of a minimum price for cotton for next crop is stimulating planting. Some cotton of last crop has sold at 1*s.* 3*d.* per ℔. and this is considered satisfactory. About two-thirds of the crop remains to be shipped. The rainfall has been very general and gradual; there has not been much 'washing'.

ANTIGUA. In a communication from Mr. T. Jackson, Curator, it is stated that the young cane crop throughout the island has materially improved during the month of April. The harvesting of the onion crop was completed; 3,300 crates were shipped for the season by the Onion Growers' Association. The Officers of the Department were specially engaged in shipping onions and other vegetables, and in making trial runs of the machinery at the Antigua Government Granary. Heavy rains fell during the month, 9·01 inches being recorded at the Botanic Station. The rainfall for the year is 16·61 inches.

ST. KITTS. It is reported from this island by the Agricultural Superintendent (Mr. F. R. Shepherd) that during the month of April, 1,800 sweet potato cuttings and 1,072 ℔. cotton seed were distributed from the Experiment Station. The reaping of the cane crop has been delayed owing to the very heavy rains during the month. The Factory was compelled to shut down to clear the railway lines of the sand brought down from the hills, and the muscovado estates could not grind for want of fuel. The young cane crop has made good progress and the late supplies will now come forward. Preparation is being made for planting cotton, and on some estates in the northern districts many fields have been planted. Owing to the guaranteed minimum price by the Fine Spinners, a much larger acreage is being put in cotton than was originally intended. At a meeting of the Agricultural and Commercial Society held on April 13, a circular from the Imperial Commissioner of Agriculture on the subject of Lima beans as a field crop, was read. The rainfall for the month was abnormal, 9·15 inches being recorded in Basseterre, while in the northern districts on one estate 29 inches were registered. Most abnormal weather was experienced, the wind blowing from the south-west with very heavy sea.

NEVIS. During the month of April over 300 acres of cotton were planted. There has been greater activity shown with regard to this crop since information concerning the minimum price to be paid has been received from the British Cotton Growing Association, and planting preparation is in progress throughout the island. A fairly large acreage was planted in provision crops during the month, consisting chiefly of sweet potato, peas and cassava. It might be mentioned that Lima beans were planted in part of the demonstration plot in the Experiment Station. The rainfall for the month was 5·65 inches.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the development of West Indian Fisheries, and indicates some of the directions in which research might be done in order to utilize more fully the resources of West Indian waters.

Under the heading of Citrus Fruits, on page 180, will be found three articles dealing with different aspects of this subject in the Philippines, New South Wales, and in Sicily.

Insect Notes, which will be found on page 186, deal with corn ear worms, the pink boll worm of cotton, and the Guinea grass moth.

Departmental Reports, reviewed on pages 190 and 191, contain much useful information concerning horticultural work in Hawaii, and the general progress made in the agricultural industries in the Bahamas.

Publications of the Imperial Department of Agriculture.

The Annual Report on Sugar-cane Experiments in the Leeward Islands for 1913-14 is now being distributed. This report, as in the case of those of previous years, comprises Part I dealing with varieties of sugar-cane, and Part II, which gives the results of the manurial experiments. The report will be reviewed in the next issue of the *Agricultural News*.

The first number of Volume XV of the *West Indian Bulletin* is about to be issued shortly, together with the index to Volume XIV of that journal. The contents of this forthcoming number will be found on page 2 of the cover of the present journal.

Passing through the press is a new pamphlet on onion cultivation, prepared in Antigua by Mr. Jackson, Curator of the Botanic Station, who has been closely associated with the recent development of onion growing on co-operative lines.

In spite of the fact that most of the West Indian islands will not send exhibits this year to the Canadian National Exhibition, it is intended to publish as usual the handbook entitled 'The West Indies in Canada'. Intending advertisers should not fail to take this opportunity of bringing themselves before the Canadian public.

Pearl Oyster Possibilities.

In connexion with the editorial in this issue, two interesting references to oyster fisheries appear in the *Wealth of India* for February 1915, and the *Hawaiian Forester and Agriculturist* for April 1915. The latter publication quotes the *Agricultural News* as regards the establishment of pearl oyster beds in some of the West Indian islands, and states that in Hawaii this culture was once tried at Pearl Harbour, Oahu, but nothing has been heard of any revival of the experiment for some years, although the harbour named has upon its shores remains of ancient oyster beds of great extent.

The *Wealth of India* deals in a more general and detailed way with shell fisheries in South India. It is said that the success of a pearl fishery depends upon the yield from the first 1,000 oysters. If there is a large crop, then succeeding batches command a ready sale at high prices. The investigation into the way in which a pearl is formed, namely, by the irritation set up by a small parasite or a portion of sand, has revealed the possibility of the artificial inducement of pearl formation. A reference in this article to the 'marking ink' which is shot out by cuttle-fish into the water as a means of escape from natural enemies leads one to speculate whether this might not be possible of utilization on commercial lines. The so-called 'sea cat', common on the shores of Barbados, contains what is probably a similar secretion, as any one who has had one of these animals attached to his hand or foot will know. The matter is interesting as affording still another possible resource of West Indian waters.

Exports from Antigua in 1914.

In the Leeward Islands *Gazette* for March 25, 1914, there is published a return of produce exported from Antigua for the year January 1 to December 31, 1914, with a comparative statement of exports for the year previous. From this it is gathered that 11,431 tons of crystals and 4,011 tons of muscovado sugar were exported in 1914 as against 8,536 and 1,666 tons, respectively, in 1913, while in the case of molasses, the similar figures were 5,962 and 6,243 puncheons, respectively, or a decrease of 381 puncheons in 1914. The exports of cotton in 1914 amounted to 775½ bales as against 766 in 1913. In regard to onions, there is an increase over the 1913 exports of 2,151 crates, the figures being (1913) 4,406 crates, and (1914) 6,557 crates, respectively. There is, however, a decrease in the exports of citrus products in 1914 as compared with 1913, 869 barrels of limes, and 287 barrels of raw and 57 of concentrated lime juice having been exported in 1913, as against 707 barrels of limes, and 141 barrels of raw and 28 of concentrated lime juice, in 1914. Of pine-apples, the exports were 1913, 371 barrels; 1914, 259 barrels—a decrease of 112 barrels.

Selection of Rubber Seed.

That considerable possibilities lie before the selection of *Hevea brasiliensis* was one of the chief impressions of Professor Bateson during his journey through the Tropics from Australia last year, and it is satisfactory to learn from the *India Rubber Journal* that Dr. Cramer is giving the matter systematic attention in Java. This scientist's exhibit at the Batavia exhibition contained an interesting series of selected seeds of Para rubber, and the photographs of some of these in the above-mentioned Journal (for March 6, 1915), show clearly the remarkable and apparently constant differences that exist. It is hoped by selection to obtain seedlings adapted for growing at high elevations but more especially to increase the yielding capacity of trees growing under ordinary environments. The present tendency to plant wide, and the comparatively low price for rubber make it all-important to obtain from each tree a maximum yield, so that Dr. Cramer's work will be closely followed by all those who are connected with the production of Hevea rubber.

Government Aid in the Establishment of Sugar Factories.

An interesting event for the West Indies is the recent introduction of a Bill in the Philippines for providing a Sugar-Central Board composed of the Governor-General and members appointed by him, for the purpose of establishing central sugar factories in certain parts of the territory. The *Louisiana Planter* states that the Bill provides that the Government shall guarantee the installers of the centrals 50 per cent. of the value of the sugar crops raised, and if the crops do not materialize, shall pay the difference out of its own funds.

It also provides that the owners of sugar lands may constitute a corporation and establish a central, with the further condition that no grower who shall enter into a contract shall sell to any other central within the limit of seventeen years. It is proposed to utilize the gold standard fund to loan money to the corporations desiring to establish the centrals and, as special provisions, that not more than 9 million pesos equal to about 4½ million dollars gold, shall be invested.

This example of Government aid is parallel to what has been done in Queensland. *The Board of Trade Journal* for March 18, 1915, calls attention to an Act assented to last December, under the provisions of which owners or occupiers of cane land may make application to the Governor-in-Council for the construction and purchase of sugar works in their locality.

Applicants must undertake to grow cane and to subscribe conjointly one-third of the capital stock of the Joint Stock Company proposed to be formed for the purpose specified. The Corporation of the Treasury of Queensland may advance to approved companies an amount equal to two-thirds of the required capital, the shares represented by that proportion being held by the trustee of the Corporation, the loan bearing interest at the rate of 4 per cent. per annum, and the capital cost being repaid in twenty-one years at the rate of £7 12*s.* 4*d.* per cent. per annum. During the time in which the loan is being liquidated, interest to ordinary shareholders is limited to 4 per cent. and thereafter to 5 per cent. per annum.

The above lines of action point clearly to the fact that the United States and Queensland Governments are alive to the future possibilities of cane cultivation in the Tropics, and it is a matter for regret that this industry in the British Crown Colonies is not similarly fostered.

Sugar Samples at the New York Botanical Gardens.

A note appears in the *Journal of the New York Botanical Garden* for March 1915 to the effect that last year the American Sugar Refining Company took steps to replenish and enlarge the exhibit of sugars at this Garden. The specimens have now reached the museum and have been installed in their proper places. The series of crude sugars has been augmented by specimens of 'Jamaica musco' and 'Porto Rico centrifugal'. It is said that the replaced specimens of 'fine granulated' and 'coarse granulated' and also those of the 'Cube' and 'cut loaf' are particularly showy. However, it is stated that the most conspicuous of all are the specimens comprising the 'crystal domino' sugars.

INSECT NOTES.

CORN EAR WORMS.

In the West Indies there are two insects which attack Indian corn, injuring the leaves and eating into the ears. These insects cause a large amount of injury, and sometimes seriously affect the value of the crop.

The more common, and consequently the more injurious, of these is the corn ear worm (*Laphygma frugiperda*), and the other is the cotton boll worm (*Heliothis obsoleta*).

In the United States both these insects occur, but they are known by other common names. The former, *Laphygma frugiperda*, is called the fall army worm, and the latter, *Heliothis obsoleta*, is called the corn ear worm: this is because the latter is the most serious of the caterpillars attacking corn ears.

These two caterpillars are alike in their habit of eating leaves and ears of corn. The moths differ in the habit of egg-laying. The Heliothis female distributes the eggs, depositing them singly on the food plant, while the Laphygma female deposits eggs in clusters which are covered with down from the body.

On Indian corn, Heliothis deposits eggs on the silks of the ear, and the newly hatched caterpillar eats its way at once into the tip of the ear. This of course can happen only if the corn is in the right condition at the time when the eggs are being laid. At other times, the eggs are laid in other places and on many different plants, and the young larvae feed on foliage, or fruits other than corn.

In consequence of the habit of the moth of laying eggs in the corn silk, experiments in the control of this insect by means of poison carried out at the Kansas Agricultural Experiment Station were confined to the application of insecticides to the silks.

These experiments were made the subject of a paper read at the meeting of the American Association of Economic Entomologists at Philadelphia, in December last, entitled Recent Results in the Use of Dust Sprays for Controlling the Corn Ear Worm, by James W. McColloch.* The results obtained indicate that powdered arsenate of lead was the most suitable poison for this purpose, and in this case a mixture of 63 parts by weight of arsenate of lead and 37 parts of sulphur was used. The sulphur was used to prevent the development of those fungi which follow the injuries caused by the worms.

Powdered arsenate of lead was dusted on the corn silks at intervals of three days during the time the silks remained fresh. The poison was applied by means of a bag of cheese cloth. This treatment resulted in a very considerable reduction of the injury, but it was found too expensive. The use of unslaked lime instead of sulphur would probably cheapen the cost, and less frequent applications would be likely to give nearly as good results in the control of the worm, and this also would help to keep down the cost

It is likely that with a considerable extension of corn cultivation in the West Indies, the pests of this crop, especially the corn ear worm and the cotton boll worm, will increase in abundance. If powdered arsenate of lead is efficient in killing these insects, and if it can be used in mixture with lime or sulphur, without injury to the corn plant, planters may be ready with a weapon in hand to meet the attack. In dealing with these insects under local conditions the whole plant, especially while it is young, will have to be dusted, in order to destroy those caterpillars which feed on the leaves, and special effort will need to be made to destroy the larvae in the centre, the throat or curl of the plant.

The use of a mixture of Paris green and corn meal has been suggested in Departmental publications, as affording a remedy against caterpillars in the throat of the plant. Arsenate of lead will probably entirely replace Paris green for use on corn, since the latter is liable to injure the plant, while the arsenate of lead does not appear to do so.

*See *Journ. Econ. Entom.*, Vol. VIII, p. 211, April 1915.

THE PINK BOLL WORM OF COTTON.

The pink boll worm (*Gelechia gossypiella*, Saunders) is a very serious pest of cotton in practically all the cotton-growing districts of the old world, and it is also established in the Hawaiian Islands. The following quotation from the Annual Report of the Hawaii Agricultural Experiment Station for 1913, indicates how serious a pest this insect is in those islands: 'The pink boll worm still continues its ravages and there is little hope of a cotton industry in Hawaii until some remedy has been found for this pest. The cotton area in the Islands are growing less instead of greater.'

In the West Indies, every effort should be made to prevent the introduction of the pink boll worm, which should be regarded as being almost, if not quite, as serious a pest as the boll weevil.

How easily this pest may be introduced is shown by the following sentence quoted from a paper entitled, Important Insect Pests Collected on Imported Nursery Stock in 1914, read before the American Association of Economic Entomologists, by Mr. E. R. Sasscer, and published in the *Journal of Economic Entomology* for April 1915: 'Larvae of the pink boll worm (*Gelechia gossypiella*, Saunders) were found in three shipments of Egyptian cotton seed, one of which exhibited a 20-per cent. infestation, and was to be forwarded to Arizona'.

Such a shipment of infested cotton seed, if admitted into any cotton-growing region, would almost certainly result in the introduction of a most serious pest.

THE GUINEA GRASS MOTH.

MOCIS [REMIGIA] REPANDA, FABR.

An account of this insect was given in the *West Indian Bulletin*, Vol. 3 , p. 238 (1902), in an article which recorded the occurrence in Barbados of the Guinea grass moth in in 1901 and 1902 when both Guinea grass (*Panicum maximum*) and Para grass (*Panicum muticum*) were rather seriously attacked by caterpillars. During 1901, grasses at San Fernando, Trinidad, were injured to an estimated extent of 70 per cent., and at Government House, Grenada, grasses were also attacked by caterpillars.

The caterpillars concerned in those attacks were the larvae of the moth (*Mocis* [Remigia] *repanda*, Fabr.).

During May, June and July 1902, the Guinea grass caterpillar was abundant in Barbados and caused a considerable amount of injury to grasses grown for stock food. The article in the *West Indian Bulletin* referred to above contained a complete record of the life-cycle of this insect, by the Rev. N. B. Watson, B.A., F.E.S.

The Guinea grass moth has been scarce in Barbados since 1902 until the present season, when it has appeared in large numbers in certain localities. It is noticeable that while this insect is called the Guinea grass moth or Guinea grass worm, the feeding caterpillar appears to have a strong

preference for the leaves of the Para grass, and to be ready also to eat other grasses after the Para and Guinea grass are eaten down.

In one infested grass field which has been examined small patches of Para grass were growing amongst Guinea grass, which in turn was bordered by sour grass (*Paspalum conjugatum*). When first examined the Para grass was entirely without leaves, the Guinea grass was somewhat eaten, while the sour grass merely showed small bits eaten out of a few leaves.

Mr. Watson summarized the life-history of this insect in the following tabular form, showing the length of time occupied in each stage of development, and how and where this time is spent:—

Egg	5	days	Attached to under side of leaf near mid-rib.
Larva	20	,,	Feeding on leaf.
,,	2	,,	Building cocoon and pupating.
Pupa	6	,,	In cocoon which is partly enclosed by leaf.
Imago	5	,,	Pairing and flying about to deposit eggs.
	39	days	

The eggs are deposited in masses of forty to sixty close to the mid-rib: these masses are easily to be seen.

The larva is a slender caterpillar about $1\frac{1}{4}$ inches in length when full-grown. It is one of the loopers or measuring worms.

There are three pairs of thoracic legs, and only three pairs of prolegs. The larva walks by taking a grip with its thoracic legs, bringing its abdominal or prolegs up, by arching its body, taking a grip with them and straightening its body out, getting a new hold with the thoracic feet.

The head is rather large in proportion to the body. The colour of the larva is gray and brown in longitudinal bands; there is a broad dark dorsal stripe which is nearly black for part of its length, broken only by very fine, delicate, light lines. The lighter, broad, lateral bands are seen to be made up of very fine stripes; the head markings are very fine, wavy stripes.

The pupa is about $\frac{5}{8}$-inch in length, of a light amber colour at first, growing darker as it gets more mature. Many of the pupae are covered with a delicate bloom such as is seen on certain fruits. This is easily noticeable when, on account of lack of suitable leaf material for the purpose, no cocoon is made. The moth is a delicately marked brown insect with a spread of wings of about $1\frac{1}{2}$ inches. In this species there is a great range of varieties even in the same batch reared from larvae which appear to be all alike.

This insect (*Mocis repanda*) is widely distributed, ranging throughout the American hemisphere and being found in other parts of the world. In the West Indies it appears to be well controlled by natural enemies, which keep it in check for long periods at a time.

The remedy which suggests itself is that of cutting the grass as soon as the attack is seen to be serious enough to necessitate action being taken. If the grass can be cut as the first brood of caterpillars is nearly mature, that is, when most of the cocoons are being formed and no eggs are being laid, the attack would be completely checked; if, however, a few moths escape, and caterpillars are seen on the young leaves as they spring after the cutting, an application of Paris green might be made. The leaves which receive the poison would not persist and be harvested with the main crops of grass, and consequently there would be no danger of poisoning the stock to which the grass was fed.

Black birds, turkeys, Guinea birds, and the common fowl are all very useful enemies of such insects as this.

SOIL LOSSES BY LEACHING.

The following conclusions are drawn by Messrs. Crawley and Cady in regard to fertilizer losses in Porto Rican soils. The complete paper will be found in Bulletin No. 8, of the Board of Commissioners of Agriculture, Porto Rico:—

From a consideration of the data as a whole, it is indicated that phosphoric acid is very quickly and very firmly fixed by all classes of soils, but that there is an appreciable loss from the light sandy soils, when the application is followed by repeated applications of water.

There is the greatest loss of nitrogen, but this is not of material consequence, except in the sandy soils. The clay soils fix the nitrogen quickly and hold it firmly.

Potash is lost from all soils, but in small quantities, except in the case of the sandy soils. Heavy rainfalls or irrigations may wash this substance out before it is fixed, especially from sandy soils, but after becoming fixed it is washed out only in small quantities.

The application of the data has a very practical bearing on plantation practices. In the case of clay soils there is very little loss of fertilizers even from very heavy rains or very heavy irrigations. The only way that losses can occur is by the water washing off the fertilizers from the surface and carrying them off in the running waters, or by washing off the soil and carrying the fertilizers with it. There is a practical suggestion in this also as to the method of application or fertilizers. Inasmuch as they become fixed so quickly, it is suggested that they do not get thoroughly mixed with the soil, nor filter down readily when applied on the surface, and that they should be mixed as well with the soil as can conveniently be done.

While the loss of phosphates from sandy soils is small, nitrogen and potash are lost in appreciable quantities in the underdrainage. It is suggested that there is not the same reason for thoroughly mixing the fertilizers with these soils as in the case of clay soils, for there is a tendency for the moisture to diffuse the ingredients. It is suggested also that fertilizers should be applied in small and frequent doses to sandy soil rather than in large doses at long intervals, for in this way there would be a more constant supply in the soils for the use of the plants.

Reference is made in *Tropical Life* for April 1915 to the ideas put forward in the *Agricultural News* early this year regarding the work done by various committees and local departments of agriculture to make the islands, and especially the crops produced by them, better known at purchasing and consuming centres. Mention is made also of the views put forward in regard to West Indian exhibits at the Imperial Institute. In this connexion *Tropical Life* suggests that it would be of greater advantage if the exhibits were installed in the city near to the big business houses and markets rather than where they are in South Kensington. There is a great deal to support this suggestion. While discussing the matter, it may be mentioned that the *Daily Argosy* (Demerara) reports that many of the samples at the Imperial Institute galleries are going to be supplemented and in some cases renewed, but the British Guiana Government is not prepared to increase the amount of $720 at present expended at the Imperial Institute for exhibition purposes.

GLEANINGS.

We understand that considerable development is to be anticipated in the Dutch Island of St. Eustatius, which lies a few miles to the north of St. Kitts. A large amount of capital is being invested in machinery for the production of cotton, and it is said that the lint will be exported to the Dutch market.

During the first seven months of 1914, aloe fibre valued at about £1,362 was exported from Mauritius to Germany. The export having now ceased, a new market is sought for this product. Mauritius aloe fibre is stated to be too fine to be substituted for sisal, but is said to be used for making a certain grade of mats and bags.

The Demerara *Daily Argosy* invites attention to the large amount of enterprise that has been shown in regard to coco-nuts in British Guiana. Remarkable progress has also been made in regard to rice, but we understand that for some time there has been a difficulty in maintaining a uniform grade owing to variation in the milling arrangements in different places.

The question of ensilage is dealt with in the *Rhodesia Agricultural Journal* for February 1915. It is said that maize, the velvet bean and some oil crop such as sunflowers mixed together make excellent ensilage, well balanced from a nutritive standpoint. It is stated further that 1 acre of maize, or maize and velvet beans weighs about 8 tons at the time of cutting, and will produce about 7 tons of ensilage.

The *Colonial Journal* for April 1915 makes mention of the use of Phosphogelose in the manufacture of sugar in Brazil. This process consists in the addition of a mixture of bicalcic phosphate and kieselghur to the juice previously treated with lime, the object being to help clarification, and to obtain a scum of manurial value. The process is at present in use in a few sugar factories in Bahia.

The employment of essential oils as antiseptics for the treatment of wounds is discussed in an article in the *Perfumery and Essential Oil Record* for March 1915. Reference is made to the employment for this purpose in France of eau-de-cologne. It is stated further that good results have accrued from the use of oriangum oil and cinnamon oil. Eucalyptus oil appears to have very little effect upon the growth of germs.

The movement in Barbados towards the introduction of farine (cassava flour) into the dietary of some of the public institutions, and the progress which is being made in regard to cassava in Trinidad render interesting the parallel efforts that are being made in Jamaica. The *Journal of the Jamaica Agricultural Society* for April 1915 republishes notes on the subject, and suggests that cassava flour should be substituted for part of the imported corn meal and wheat.

Much attention is given in the *Journal of Heredity* (May 1915) to the value of Zebu cattle. In regard to Brazil, which is the country principally considered in two of the articles, it is suggested that from a live-stock point of view the country should be divided into three zones: the first two containing dairy cattle, and the third zone, situated in the interior, the Zebu. The articles are illustrated with interesting pictures of pure and cross-bred zebu cattle.

In the *Philippine Agriculturist and Forester* (February-March 1915) an account is given of a collection of living Dioscoreas (yams) from the Philippine Islands. Six or seven species are described, and it is observed that early maturity may be somewhat characteristic of the prickly stem of plants, and may be more prevalent in plants with short tubers than in plants with elongated tubers. It is remarked that at least another year's work is advisable before attempting to make any positive statements in this respect.

Rubber from Dominica is reported on in the *Bulletin of the Imperial Institute* (January to March 1915). Three samples of Para rubber recently examined at the Imperial Institute were very satisfactory in chemical composition, containing from 93·4 to 94·2 per cent. of caoutchouc. In physical properties, however, the rubber was not so good, being rather soft and weak, and in this respect the specimens were a little inferior to previous samples of Para rubber from Dominica examined at the Imperial Institute two years ago.

One of the most important contributions to the cane *versus* English beet controversy, is a paper read by Mr. R. N. Darling before the Farmers' Club in London, which included the results of his studies on the Continent under the auspices of the National Sugar Beet Association. The paper appears to establish the fact that beets can be grown with profit in Great Britain, and the writer brings out the interesting point that the net profit from an acre of beets is much greater than that from an acre of the closely allied crops like mangels, turnips, or swedes.

Two notices in the *Gardeners' Chronicle* for March 6, 1915, refer to the Royal Agricultural Society's Show and the *Daily Mail* Horticultural Exhibition to be held in England this year. In spite of the war, the first-mentioned society will meet as usual and the show will be opened at Nottingham on June 29. The Council has decided to include a horticultural section, but it is not mentioned whether the Tropics will be represented as they were last year. The *Daily Mail* Horticultural Exhibition is being undertaken by that newspaper to stimulate the cultivation of vegetables in England. Prizes will be offered amounting to £1,000.

It is clearly proved in the *Journal of the Board of Agriculture* for April 1915, that tubercular fowls may be a serious source of infection as regards pigs. On examining the organs of a total of 118 tubercular pigs, it appeared that eighty-six of them contained bacteria identical in every detail with tubercular bacteria, twenty-eight contained bovine bacteria, and in the remaining four cases the bacteria deviated in form from both types, but in two cases closely resembled the avian type. On the whole, the results of the investigation show that the overwhelming majority of the cases of mesenteric tuberculosis are of a local character, and almost exclusively due to avian tubercular bacteria.

AGRICULTURAL EDUCATION IN SECONDARY SCHOOLS.

In a Report on the science teaching at the Antigua Grammar School for the year 1914-15, which has been forwarded to this Office, reference is made to the somewhat disappointing results obtained during the year under review. This is attributed firstly, to the constant change of Science Masters, which seriously affects the continuous course of teaching that is so necessary; and secondly, to the want of a laboratory and of a regular supply of chemicals and apparatus. In the absence of these, it is not only impossible for the boys themselves to do any experiments, but it is very difficult for the master to be able to make demonstrations in his teaching, the work consequently being purely theoretical book work, without pratical applications. Despite these drawbacks, however, it is satisfactory to note that at a special examination conducted by the Cambridge Syndicate for the first Leeward Islands University Scholarship, two candidates presented themselves, one of whom, E. A. G. Branch, won the scholarship. Amongst other subjects taken by the candidates was Agricultural Science, and in regard to this the Examiner, Mr. F. W. Foreman, B.A., wrote: 'Branch showed a good grasp of the subject. Both candidates showed a good knowledge of the local agriculture, the sugar-cane and green manuring questions being well answered.'

It might be mentioned that at this Grammar School, the course of study is based on the syllabus of the Cambridge Local Examinations; there are four Agricultural scholarships given by the Government of the annual value of £10 each. The boys who hold these do some practical gardening in the school garden for half an hour on each school day.

Whilst on the subject of secondary education reference might be made to Circular No. 883, recently issued by the English Board of Education. This is a Memorandum on the Curricula of Ruralised Secondary Schools, and therein the difficulties experienced in the West Indies in regard to the successful teaching of Agriculture in the secondary schools are strongly reflected. It is shown that despite the encouragement given by certain Local Authorities, the number of secondary schools which provide rural or agricultural courses, over and above the gardening which is not infrequently found even in urban schools as an adjunct to the teaching of Botany, is by no means large. School authorities have been reluctant to embark on what they are inclined to regard as very much of an experiment, and their reluctance has been enhanced by the doubts often expressed by farmers as to the value of instruction in 'agriculture', which it is assumed that a ruralised secondary school will attempt to provide. Discussing the place of 'agriculture' in a rural course, it is pointed out that even in the interests of the future farmer, too much stress should not be laid on the purely vocational aspect of the work, and emphasis is placed on the fact that a ruralised school should not attempt to give formal instruction in 'agriculture' as a separate subject. Technical matters of purely professional interest to the farmer should as a rule be omitted from the course. No hard and fast line, however, can be drawn between science and its applications; and a teacher of rural science should be as free to deal with matters of agricultural interest as the teacher of physics should be to deal with matters which interest the engineer.

As to the importance of outdoor work and the use of land the following is abstracted as being of special interest to those concerned in the teaching of Agriculture in the Secondary Schools in the West Indies: —

'It would perhaps not be impossible to give a more or less satisfactory ruralised course without land for outdoor work and demonstration, provided frequent nature study walks were taken, and full use were made of such specimens as the teacher might obtain from his garden or could encourage his pupils to bring; but the provision of a small plot is highly desirable in order to give as practical a turn as possible to the instruction.

'A large amount of land is not required and is in fact undesirable, as it necessitates too much repetition of operations by the pupils and leads to difficulties of management during holidays or when pupils are otherwise absent.

'The land should be in close proximity to the school; and it is essential to good teaching that the master should be as free (subject to conditions of weather) to take his class out of doors or indoors in any science period as the ordinary science teacher should be to take them in the lecture room or in the laboratory.

'The main aim in the use of the land ought *not* to be the teaching of agriculture or horticulture, but *rather* the practical teaching of biology, chemistry, and physics through the cultivation of the soil and the growth of farm and garden plants.'

Then suggestions are made for the arrangement of the land into various plots—a nature study plot, to provide material in the way of plants for nature study lessons in the lower Forms; a plot for demonstrations and experiments; a fruit plot; separate plots of about 30 square yards for each boy of at least one of the Forms.

As regards the teaching staff, so far as the teacher's academic qualifications are concerned, it is desirable that these should include attendance at a University course ending in an Honours Degree in Chemistry and Biology—followed, if possible, by further training in agricultural subjects. So far as technical knowledge of agriculture and specifically rural subjects is concerned, the training which it is desirable that the teacher should receive need not include formal instruction in the theory and practice of agriculture such as is given in Agricultural Colleges; but it should include some practical acquaintance with the ordinary operations of a garden and a farm.

A new dipping fluid called the bone oil dip is described in the *Queensland Agricultural Journal* for April 1915. Bone oil is a by-product in the manufacture of bone-charcoal and procurable in sufficient quantities from the sugar refineries operating in Australia. Experiments showed it to be fairly easily emulsified by boiling with alkali, and the resulting solution possessed a marked detergent property and retained this, in common with Stockholm tar, when compounded with hard water. From this property it was expected that arsenical solutions of standard strength containing bone oil as an adjunct would prove fully effective in tick destruction, and this supposition was amply borne out in spraying and dipping experiments. The proportions of constituents recommended are: arsenic, 8 to 8½ lb. according to quality; bone oil, 1 gallon (from 9 to 9½ lb.); caustic soda, 4 lb.—to make 400 gallons of dipping fluid. It would seem that this dip is worth the consideration of West Indian veterinary surgeons.

HAWAII: ANNUAL REPORTS ON THE AGRICULTURAL AND EXPERIMENT STATIONS FOR 1913 AND 1914.

These two publications, which have been received simultaneously, contain much useful information of interest to the West Indies. It will be convenient in reviewing them to confine attention to the summaries of investigations written by the special Agent-in-charge of the Station (Mr. E. V. Wilcox).

In the 1913 report, the chief matters of interest come under the headings of horticultural and chemical investigations, respectively. The studies that have been made on the papaw were continued, and one of the most interesting results of this work is the apparent certainty that within one or two more generations of papaw breeding, the dioecious condition in which this tree ordinarily occurs will be eliminated, with great practical advantage to the papaw grower. A strain has already been originated in which over 92 per cent. of the trees are self-fertile fruit-bearing trees. This has been accomplished by close fertilization of hermaphroditic flowers, with the result that the occurrence of male trees has already been largely eliminated, and the variation due to cross-fertilization thus avoided. It has been found also to be a very easy matter to graft papaws. A union takes place even between the pith of the scion and the stock.

In further work with pine-apples it has been found that the shape of the fruit is subject to hereditary transmission as well as other characters. Suckers from plants which bear cylindrical fruits are far more likely to produce cylindrical fruits than are plants which bear conical fruits. Since the cylindrical fruit is of considerable importance in canning, for the reason that a large number of slices of uniform size can be obtained, it is desirable to select suckers with reference to the shape of fruits which they will produce.

Turning to the section dealing with chemical investigations, it is learnt that analyses have been made of various samples of larva taken from historical flows of known date. It has therefore been possible to study the formation of Hawaiian soils from the standpoint of their history, and to learn the changes which have taken place in the disintegration of larva into agricultural soil. It is stated in the report that the opportunity for such is one rarely presented except in Hawaii; it might be suggested, however, that similar work might be done, providing equipment were available, in West Indian islands like Martinique and St. Vincent where larva flows of known date occur. In the study of the nitrogen content of Hawaiian soils it has been found that fallow or virgin soils contain no nitrate, or merely a trace, while the amount of ammonia may be rather large. Upon thorough cultivation, however, nitrification takes place quite rapidly, with the result that the form of soil nitrogen is quite different in cultivated and uncultivated soils.

Some experiments have been made in an attempt to develop methods of economically utilizing the large quantities of pine-apple juice wasted in the canning process. While pine-apple juice may perhaps be most economically used by condensing into a syrup to replace a part of the sugar in canning, it may also be used in the production of a good quality of vinegar. By the quick process, a vinegar containing from $3\frac{1}{2}$ to $4\frac{1}{2}$ per cent. of acetic acid may be produced in twenty-four hours, and the percentage of acid will increase by subsequent standing. No difficulty is experienced in securing the acetic fermentation after the proper alcoholic fermentation has been brought about, but the main difficulty is encountered in handling the juice so as to prevent an improper fermentation at the start, thus destroying the flavour of the vinegar or preventing the formation of sufficient alcohol.

The report for the year 1914 begins with a reference to the trouble which has been caused in the fields of Hawaii by the sedge commonly known as the Japanese nut grass (*Cyperus rotundus*). This pernicious weed has spread rapidly and no really efficient method has been evolved whereby it can be eradicated or even kept down. With reference to the papaw experiments mentioned in the previous year's report it is stated that the results obtained in 1914 give promise of complete success within two or three more generations of papaws. The examination of 454 trees of the second generation of breeding showed that $95\frac{1}{3}$ per cent. of these trees are fruit-bearing with perfect flowers. Two male trees were cut off 3 feet from the ground, and when the new branches came out it was found that the sex had been changed and that regular perfect flowers each bearing fruit were developed. Further work on the papaw has been that dealing with the production of papain. It has been found that dried papain can be produced at a profit for about $2·50 per lb. Interesting experiments at the station have shown that if in the early morning a dozen shallow lengthwise incisions $\frac{1}{2}$ to $\frac{3}{4}$-inch apart are made in a papaw tree of good size, enough juice will be obtained to make $\frac{1}{2}$-oz. of dried papain. Fruits may be tapped on alternate days five to seven times in all. As soon as the fruit begins to turn yellow the milky juice flows less freely. The tapping wounds heal quickly, and the fruit is not injured by tapping; in fact, the flavour appears to be somewhat improved, since a slight bitterness which characterizes the juice is thereby removed.

Chemical investigations have concerned principally the effects of heat upon the soil. One of the striking effects was the unusually rapid formation of ammonia after the soil had been heated. Heating soils seems to bring about rapidly the effects which are otherwise obtained more slowly by aeration. It has been noted in the case of all plants that growth is much more rapid on heated than on unheated soils. Attention has been devoted also to a study of the physical properties of soils with interesting results, which may be summed up by saying that in heavy clay soils all fertilizers used alone, or in mixture at the ordinary rate, have been found to check the movement of soil moisture. In a study of the function of fertilizers in soils it was found that phosphoric acid was fixed to a greater extent than other fertilizers. The use of dynamite for soil improvement continues to increase. Satisfactory results have been obtained on pine-apple plantations, but it is emphasized that in all cases where dynamite is employed, the soil must be dry. The use of dynamite for the improvement of lawns has been found particularly satisfactory.

In concluding we may make reference briefly to one or two miscellaneous matters. Much attention has been given to the cultivation of legumes, particularly beans, for instance the Algaroba bean (*Prosopis juniflora*), which provides a valuable meal for horses and mules. Interesting work has been conducted in regard to the cold storage of tropical fruits. It

has been found that holding fruit infested with the fruit fly for a period of ten days at a temperature of 32° F. destroys the fruit fly in whatever stage it may be present. It is suggested that perhaps cold storage will be accepted as a sufficient means of rendering fruit such as avocados safe for importation into the United States.

BAHAMAS: ANNUAL REPORT OF THE BOARD OF AGRICULTURE, 1914.

Owing to the exceptional and steady rainfall throughout the Colony, and the encouragement and assistance given by the Board, the crops are proving themselves unusually good, and the areas cultivated larger than for many years past.

CITRUS FRUIT. The grape-fruit market was depressed and little shipped on account of low prices abroad. Some quantities shipped by various war funds to England.

CORN. At the outbreak of the war some 77 bushels of seed corn were distributed to planters in the Windward Islands. Reports as to the crop now ripening are unanimously favourable and the crop, both in Indian and Guinea, will undoubtedly be a good and large one.

COTTON, SEA ISLAND. An expert cotton planter from St. Kitts having been obtained, two experiments have been undertaken with the assistance and under the supervision of the Board. One at Clarence Town, Long Island (10 acres), and two at Exuma (aggregating 8½ acres). Reports of the former and of half of the area at Exuma are good and encouraging to the industry, provided the people can be induced to continue the cultivation in future years. The pests have not been found insuperable. The crop is now being reaped but actual results are not yet obtainable.

ONIONS. The Board having imported seed from Teneriffe for the purpose, the cultivation of this staple vegetable has been largely extended, and arrangements are being made to supply growers with crate material and facilities for shipping to the Northern market.

PEANUTS, SPANISH. Have last season been imported and are again now being sold and distributed for the same purpose.

PEPPERS. A beginning has been made in the growing and shipping of these in the Out Islands that promises to develop considerably now that growers have learnt the cultivation and found the market.

PINE-APPLES. The depression of the previous years still held good, and the crop was still smaller. For the last twelve months, however, experiments in fertilizing have been carried out by various growers in various sections with such success that at all events a beginning in revival has taken place, and it can be confidently anticipated that the year's crop will be larger and better than the one just passed. The Board has contracted for a quantity of slips (30,000 dozen) to be distributed together with fertilizer and instructions of the new method to reliable cultivators, not otherwise able to extend their fields.

POTATOES, IRISH. Of these 95 barrels have been distributed on terms of payment on the reaping of the crop, in order to encourage the industry. The effects are now seen by arrivals in Nassau from the Out Islands, at present selling at fair rates.

POTATOES, SWEET. A stock of well recommended 'Triumph' sweet potatoes has been imported by the Board and distributed for propagation purposes throughout the Colony.

SISAL. While exports have more than held their own in quantity, values have greatly fallen off on account of the war and the consequent stringency in the money market in the United States, and the low rate of Mexican exchange. There has been no improvement in the quality of hand-cleaned exported.

TOMATOES. This is a growing industry, as is shown by the fact that up to January 31 as many boxes had been shipped as last season, altogether (20,000 crates). The Board has assisted the cultivation by supplying seed, fertilizer (cave earth), and crate material in which to ship them, and by otherwise fostering the export by attending to the shipments from the Out Islands. A new foreign buyer has entered the market who is doing the packing in Nassau, and shipping partly by S.S. 'Miami', thus breaking down the drawback of only fortnightly communication hitherto existing.

VEGETABLES GENERALLY. By the importation and sale of various kinds of seeds, both in New Providence and the Out Islands, aided by the favourable rains, the growing of vegetables has been considerably increased, and is educating the people in their consumption as food.

AGRICULTURAL EDUCATION. In conjunction with the Board of Education, elementary Agriculture has been taught in the schools, text-books, seeds and tools have been supplied by this Board and out of a total of sixty-one schools (Public and Grant-in-aid) fifty-one are now so engaged, and are displaying interest on the part both of pupils and teachers.

STOCK, SHEEP. From the Southdown ram imported at the end of last year (1913) and thirty ewes purchased here, twenty-four out of a total of thirty-one lambs are now at the Botanic Station. The starting of this venture was not made at the right time of the year to give better results, which however of late months have greatly improved. Some of the young stock are now ready for distribution through the Out Islands.

PIGS. Of those contracted for (seven) four arrived here in April but so small that breeding could not then be undertaken; with the exception of one that died, three are now in a state to breed, and the other three it is hoped to be able to get here in the immediate future, communication this winter having ceased with Jamaica. The boar is offered for service on the open market.

PRODUCE EXCHANGE. This was carried on last spring and proved itself useful in the maintaining of prices to growers of such articles as onions, Irish potatoes, corn, etc. Much of the latter the Board was able to distribute at the time of the outbreak of the war. There is only apparently a small field for this undertaking, but the moral effect of keeping prices firmer, by the Out Island farmer not having to make immediate sale in order to return home, is good.

The expenditure of the Board to January 31, is £685 16*s.* 7*d.*, and the receipts (from fruit and sale of seeds etc.) £67 7*s.* 5*d.*

The Loss of Fertilizers in Tropical Soils.—In Bulletin No 1. (Scientific Series) of the Department of Agriculture, Mauritius, which deals with the absorptive power of soils, the Director summarizes the results obtained by the writer of the paper (M. P. de Sornay), as follows:—

'A study of the absorbing powers of Mauritius soils for salts used as fertilizers has been the subject of careful investigation by M. de Sornay. The data given are the result of work carried out mainly during 1912, and are of considerable interest to agriculturists in the Colony.

'The results obtained indicate that the loss of fertilizing elements, even after cyclonic downpours, is not considerable, if washing away of soil does not actually take place.'

MARKET REPORTS.

London.—The West India Committee Circular, April 6, 1915.

Arrowroot—$2\frac{1}{8}d.$ to $2\frac{9}{16}d.$
Balata—Sheet, 2/2; block, 1/11¼ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 98/- per cwt.; Grenada, 89/- to 96/6; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £26 10*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 15*d.* to 18*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Quiet.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, no quotations; concentrated, £21; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations
Mace—1/4*d.* to 2/11*d.*
Nutmegs—$4\frac{1}{4}d.$ to $5\frac{3}{4}d.$
Pimento—Quiet.
Rubber—Para, fine hard, 2/5½; fine soft, 2/3¾; Castilloa, 1/7 to 2/-.
Rum—Jamaica, 3/ to 4/

New York.—Messrs. Gillespie Bros., & Co., May 11, 1915.

Cacao—Caracas, 15½c. to 16c.; Grenada, 16c. to 16¼c.; Trinidad, 15½c. to 15¾c.; Jamaica, 14½c. to 15c.
Coco-nuts—Jamaica, selects, $25·00 to $26·00; Trinidad, $26·00 to $27·00; culls, $15·00 to $16·00.
Coffee—Jamaica, 8¼c. to 12c. per lb.
Ginger—9¾c. to 12c. per lb.
Goat Skins—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 39c. to 42c. per lb.
Grape Fruit—Jamaica, $1·75 to $2·50.
Limes.—$9·00 to $10·00.
Mace—48c. to 55c. per lb.
Nutmegs—11½c. to 12c.
Oranges—Jamaica, $1·75 to $2·25.
Pimento—3¾c. per lb.
Sugar—Centrifugals, 96°, 4·70c.; Muscovados, 89°, 4·05c.; Molasses, 89 , 3·93c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., May 17, 1915.

Cacao—Venezuelan, no quotations; Trinidad, $19·92 to $20·16.
Coco-nut Oil—75c. per Imperial gallon.
Coffee—Venezuelan, 11c. per lb.
Copra—$4·00 to $4·25 per 100 lb.
Dhal—$7·50.
Onions—$4·00 per 100 lb.
Peas, Split—$12·00 per bag.
Potatoes—English $2·25 to $2·50 per 100 lb.
Rice—Yellow, $6·00 to $6·25; White, $7·25 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. T. S. Garraway & Co., May 31, 1915.

Arrowroot—$4·00 to $4·50 per 100 lb.
Cacao—$14·00 to $15·00 per 100 lb.
Coco-nuts—$16·00.
Hay—$1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $82·00 per ton.
Molasses—No quotations.
Onions—$3·00 per 190 lb.
Peas, Split—No quotations; Canada, $5·85.
Potatoes—Nova Scotia, $4·00 per 160 lb.
Rice—Ballam, $6·00 to $6·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, no quotations.

British Guiana.—Messrs. Wieting & Richter, May 1, 1915; Messrs. Sandbach, Parker & Co., April 30, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	$10·00
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	15c. per lb.	16c. per lb.
Cassava—	96c. to $1·20	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$20 per M.
Coffee—Creole	——	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	——
Liberian	10c. per lb.	13c. per lb.
Dhal—	——	$8·25 per bag of 168 lb.
Green Dhal.	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	5c. per lb.
Madeira	——	——
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$2·50	$2·75
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·68	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
Tannias—	$2·88	——
Yams—White	——	——
Buck	$2·64	——
Sugar—Dark crystals	$3·50 to $3·60	$3·75
Yellow	$4·00 to $4·10	$4·25
White	——	——
Molasses	$3·10 to $3·25	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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The American Society of Agricultural Engineers.

UP to the present agricultural engineering has not been recognized as a specific branch of agricultural science in the tropics as it has been in the United States and in some European countries. This is largely due no doubt to the fact that all mechanical devices have to be imported into the tropics which necessitates procuring also from abroad responsible engineers. The economic importance of agricultural engineering is perhaps greater than any other branch of agricultural science, for upon it is dependent agricultural development to a very large extent. In the West Indies the sugar industry is dependent upon engineering in regard to factories, and even in the cacao, cotton and lime-growing industries imported machinery and its proper working is a necessary factor. But besides these phases which imply the investment of considerable capital, agricultural engineering underlies the conduct of ordinary operations on the estate, such as ploughing and the carting of produce. As well as these there is the important subject of drainage, irrigation and other aspects of water-supply.

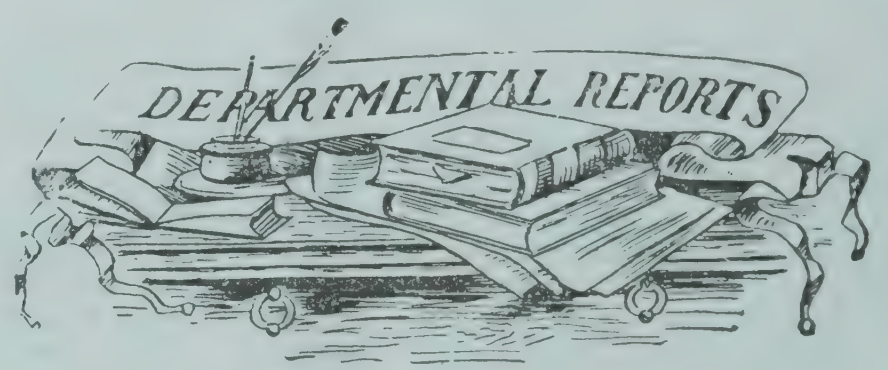
The transactions of the American Society of Agricultural Engineers for 1914 present an interesting review of recent work in engineering relating to agriculture in the United States. Two of the papers deal with the place and field of the agricultural engineer, and in these it is held that the engineer should be closely associated with agricultural activity. For instance it is not sufficient to be able to design and handle a motor plough: it is equally necessary to be familiar with the adjustment required in regard to soil variation and other fluctuating factors which are so constantly met with in the application of exact science to agriculture. An important side of agricultural engineering which we have not yet mentioned is that of ventilation. This subject is dealt with in the publication under consideration, but from the tropical standpoint, owing to climatic conditions, it is probably not as important as under temperate conditions where the protection from cold is more liable to interfere with the maintenence of a pure atmosphere. In this paper the interesting fact is mentioned that it is not simply an increase in the percentage of carbon dioxide in the air of a stable that

is so injurious as the accompanying rise in temperature. At the same time it is always desirable to keep the carbon dioxide content at a minimum, if only because of the consideration that fresh air renders animals more immune to diseases like tuberculosis.

Another subject which receives attention is the economy of small farm gas engines. These machines are now being commonly employed on estates in the tropics, but it may not be generally known that engines develop their best fuel economy not at their maximum load, but at a load approximately 67 per cent. of the maximum load. In America the draft of waggons has also received much investigation. The invention of a new form of dynamometer has enabled interesting curves to be obtained showing the variation in the horse-power exerted on roads of different surfaces and grades over long distances. This work is being continued, and within the next few years a sufficient number of observations will have been made to allow of the deduction of very general conclusions. One question that is being studied is the effect of the width of tyres on draft. In this connexion it may be pointed out that in regard to carriages, a rubber tyre necessitates the expenditure of greater energy in starting and stopping than does an iron tyre. Most planters in the West Indies recognize that there is need for the investigation of draft work locally, particularly in connexion with the relative efficiency for different draft purposes of cattle and mules.

The last phase of agricultural engineering which we may consider is the teaching of the subject. For the agricultural student, most authorities agree that a theoretical beginning should consist of a study of mechanics, and that a practical start should consist of work in the forge and in the carpenter's shop. On the farms attached to agricultural colleges and experiment stations there is generally every facility for studying the different aspects of agricultural engineering. The various appliances employed for the cultivation of the soil and for the preparation of crops may be tested or considered from a theoretical aspect, while the gas engines and various pumping appliances will often be available for critical examination. On the average estate in the tropics the machinery is frequently rather specialized, as in the case of the sugar estates. Nevertheless for educational purposes it would be difficult to find a better equipment for studying engineering in its agricultural aspects than in the central factory and on estates connected with it, which are run on labour-saving lines.

The considerations in the above paragraph concern the training of the planter rather than the agricultural engineer. In fact they imply his existence. There are few institutions at present capable of training such an expert, though some of the American colleges in which mechanics and agricultural departments are in touch might suffice. The agricultural engineer is essentially an engineer, and of course a specialist depending upon whether branches of irrigation, architecture, surveying, implement designing or machinery are taken up. But he must also be an agriculturist in the sense that he must understand agricultural economy, and be in a position to look at things from the planter's point of view.



SUGAR-CANE EXPERIMENTS IN THE LEEWARD ISLANDS, 1913-14.

The series of experiments here reported on have been continuously in progress for a period of fifteen years, and it has been an essential feature to conduct them in a uniform manner on the fields of sugar estates situated in the different sugar-producing districts. The experiments with varieties of cane constitute the vehicle through which new and promising varieties are introduced into cultivation; while the manurial experiments afford important information as to the most remunerative way of supplying these varieties with plant food.

EXPERIMENTS WITH VARIETIES OF SUGAR-CANE.

The report under review is divided into two parts as in former years, Part I dealing with experiments of sugar-cane, and Part II, dealing with manurial experiments. The past season's trials in Antigua have indicated, in the case of plant canes, the superiority of B.4596, B.6450 and Sealy Seedling, amongst others. The first and last of those mentioned have occupied high positions in the list for several years, and their continued satisfactory behaviour enables them to be confidently recommended to planters. B. 6450 is now well known as a valuable cane in Barbados, where it has won for itself a very favourable opinion. It is of interest to record that three other Barbados varieties introduced into the experiments for the first time last year have shown promise as plant canes, namely, B.6204, B.4934 and B.4030. B.4030 is in many respects an interesting cane and its behaviour will be watched with attention. Turning to ratoon canes in Antigua, it will be observed that once more the list is headed by B.4596. The second cane on the list is B.3922. Both these varieties

gave about 3,400 lb. of sucrose per acre as compared with 4,990 lb. of sucrose per acre for B.4596 as a plant cane. Another satisfactory ratoon cane in Antigua, as shown by last year's figures, is B.1528.

Turning to the experiments in St. Kitts it will be seen that during the season under review the leading cane was D.109; it gave an average yield of 8,680 lb. of sucrose and 40·7 tons of cane per acre. During successive seasons this variety has gradually come to the front, and appears worthy of careful and extended trial, as well suited to St. Kitts conditions. The second cane on the list is D. 116 which may also be regarded as eminently suited for St. Kitts, whilst it is of interest to record that the third cane on the list is the locally raised seedling A.2. Other varieties which continue to show promise are B.316, and B.254. It is observed that B. 1753 has shown a gradual decline from the high position which it occupied a few years ago.

In regard to ratoon canes in St. Kitts, D. 109 again takes the lead, yielding 6,510 lb. of sucrose and 29·3 tons of cane per acre. Second on the list is A. 2, and B. 254, Sealy Seedling and B· 376 are third, fourth and fifth, respectively.

While considering the subject of cane varieties it will be convenient to make reference here to the section at the end of the report on the area under cultivation in different varieties. An interesting table shows that in Antigua since 1907 there has been a gradual increase from 21·4 to 64·1 in the percentage of total area under varieties other than White Transparent and Bourbon. Nevertheless White Transparent has not been easily displaced, and as a matter of fact occupies the largest area at the present time in Antigua. In St. Kitts this variety is also extensively cultivated, but the area under it is slightly exceeded by that planted in B. 147. In Antigua, Sealy Seedling comes next to White Transparent, while noteworthy increases in area in this island have occurred in the case of B. 4596, B. 6450 and B. 3412. In St. Kitts considerable increase has occurred in the case of D. 109, though the largest increase is put down to 'Mixed Varieties'. It is unfortunate that such an indefinite form of nomenclature is necessary. Decreases of some magnitude are seen in St. Kitts in the case of B.1753, D. 116, and B. 109.

MANURIAL EXPERIMENTS.

The manurial experiments during the season under review contain a feature of fresh interest, namely, manurial experiments with plant canes. Readers who have followed sugar-cane experiments in the Leeward Islands during past years will know that the manurial experiments with plant canes were discontinued in 1907, when it was held to have been adequately demonstrated for the Leeward Islands that a proper supply of pen manure is sufficient for the needs of plant canes and that the additional application of artificial fertilizers is not remunerative. The reason for restarting the experiments rests in the circumstance that an adequate supply of pen manure is not always available and it is therefore desirable to find out what combination of fertilizers is best calculated to avert the losses in fertility in cases where this happens. The result of the first year's trials are decidedly interesting and instructive, but it will require to be supplemented by the results of subsequent years before permanent conclusions can be arrived at. Subject to this reservation, the results up to the present indicate that in the absence of a dressing of pen manure, applications of artificial manures are of benefit, and that such applications should contain adequate amounts of nitrogen, potash and phosphates. To show the extent of the benefit to be expected, we may give the result obtained in the experiments Nos. 5, 11 and 20. The application of pen manure at the rate of 20 tons per acre produced an increase in yield of 7·3 tons of cane per acre; in Nos. 5, 11 and 20 the application of 60lb. of nitrogen as sulphate of ammonia in conjunction with 40lb. of phosphoric acid as basic slag and 60lb. of potash as sulphate has produced an average increase of yield amounting to 7·5 tons of cane per acre, and profit amounting to 21*s.* 0½*d.* when canes are valued at 10*s.* 10*d.* per ton, and 58*s.* 6¼*d.* when canes are valued at 15*s.* 10*d.* per ton. This case clearly shows that it is possible to substitute profitably artificial manures for pen manure; but at the same time it must be remembered that a supply of humus is always necessary, and that if pen manure cannot be obtained in fair quantities, resort must be had to green dressings or other forms of organic matter.

Section 2 of Part II in this report deals with the old series of manurial experiments with ratoon canes. A general survey of the results shows that nitrogenous manures have in all cases led to increased yields. Although the addition of potash and phosphate induces a greater return, the increases experienced are not as remunerative as when nitrate of soda or sulphate of ammonia are used alone. On the whole, the results indicate again that, in the case of ratoon canes, the most satisfactory manurial application is in the form of single doses of quick acting nitrogenous manure conveying nitrogen at the rate of 40 lb. per acre, and applied at an early stage in the growth of the cane. In relation to the recently introduced nitrogenous manures, nitrolim and nitrate of lime, it has been shown that nitrolim is ineffective as a manure when applied to ratoon canes, but that nitrate of lime possesses a value nearly equal to that of sulphate of ammonia. The effect of small dressings of lime has been negative, but when larger dressings of marl have been given, benefit has been derived, especially in the case of heavy non-calcareous soils.

DEPARTMENT NEWS.

Dr. Francis Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies, returned to Barbados by the S.S. 'Guiana' on June 9 after having made a lengthy tour occupying nearly five weeks in the Northern Islands. The object of the visits to the different islands was to discuss with the Governments and local planters various agricultural topics, particularly in regard to the central factory question and the cultivation of corn and other food crops. The longest visit was paid to Dominica where the Commissioner spent eleven days visiting the Botanic Gardens and various estates. In St. Kitts and in Nevis nine days were spent, while in passing down the islands, a short visit was made to the French island of Guadeloupe. Two visits were made to Antigua occupying altogether five days, and on the return to Barbados a short time was spent at St. Lucia. The Commissioner returned with Mr. W. Nowell, Mycologist to the Department, who has spent several weeks in the interior of Dominica investigating the red root disease of limes, the cause and extent of which have been satisfactorily determined.

FRUIT.

COCO-NUTS IN THE WINDWARD AND LEEWARD ISLANDS.

In St. Vincent, during 1913-14, the planting of coco-nuts was still continued, about 29,000 being imported for the purpose. In St. Lucia an extension is also taking place. Planting has continued, and preparations are in progress on several estates for further extension of the area under this crop. The quality of the nuts in St. Lucia is, on the whole, very good. With careful selection it is possible to get local nuts of excellent quality for propagating purposes. The local demand for selected seed nuts has been very considerable, and the exports in consequence showed but a slight increase in 1913-14: 80,097 nuts valued at £234 0*s.* 11*d.*, and 69 cwt. of copra valued at £68 18*s.* 4*d.* were exported.

The coco-nut palm flourishes with great vigour in Dominica, and a very considerable industry has been established, though there is plenty of room for further extensions. Over half a million nuts were exported in 1912, and the continued investment of capital will lead to still greater shipments in the future.

In Antigua there were about 46 acres of coco-nuts planted in the island during the year. The interest in this industry is being maintained, for some 5,000 nuts are ordered for planting purposes next year. On the whole, the plantations are in a promising condition, but there are instances where drainage is necessary if success is to be secured. This point has been brought forward on previous occasions, but its importance is such as to allow of repetition, for it would seem that if some cases are neglected success cannot be looked for. The coco-nut trees are, on the whole, singularly free from disease. Scale insects are somewhat common but these have caused up to the present little or no apparent damage.

The coco-nuts at Pinneys estate in Nevis continue to be satisfactory; the trees are perfectly healthy, and are bearing well. The area now under cultivation is about 220 acres.

Arrangements are being made to carry out manurial experiments in the plantation under the supervision of the Department of Agriculture.

During the year, 41,400 nuts were collected. A fair number of these were used for planting purposes, and the rest were shipped to the New York market, where good prices were realized.

Other small plantations exist in the island.

During 1913-14, the planting of coco-nuts by the Government and proprietors of land in the Virgin Islands received much attention. The interest displayed in the orders for plants this season must in a great measure be attributed to the example shown by the Experiment Station in planting out a 4-acre demonstration plot of this palm.

In order to meet the demand for plants in the Virgin Islands, selected nuts were obtained locally from a group of trees growing at Cappoons Bay estate, the property of J. B. Rommey, Esq. Trees on this estate are quite free from any insect or fungoid pests, very prolific, and producing a nut over 4 inches in diameter.

In view of these facts, together with the risk that is run in importing disease by the importation of plants, the Department deemed it wise to propagate from local sources. Up to the time of writing, approximately 35 acres of coco-nuts have been established. Particular attention must be drawn to the establishment of a 20-acre plantation by a recent settler in Tortola. The soil on this plantation is of a sandy loam nature, and should the proper subsequent treatment be given to the plants, it is reasonable to expect that a remunerative yield will be obtained.

Continued interest has been shown in the planting of this crop, and it is estimated that approximately 50 acres will be put into coco-nut cultivation next season. It is hoped that the interest will be kept up, as there is great scope for the development of a coco-nnt industry in the Virgin Islands.

THE WILD CITRUS FRUITS OF MADAGASCAR.

There has appeared in commerce in London during the last two years a curious bronze-coloured orange, marked with one or two longitudinal orange-yellow stripes, but having the odour of the edible orange and a sweet juice.

On enquiry of the fruiterers (who charged 4*d.* each for them) these oranges are stated to come from only one grower in Spain, whose name is kept a secret by the trade at present, and who is believed to have used a graft of a bronze-coloured Madagascar orange on the ordinary Spanish sweet orange.

According to a note in the *Journal of the Royal Society of Arts* (April 2, p. 467) there are wild species of Citrus, but in the centre and on the east coast of the island oranges and mandarines are grown in small quantities from planted trees.

The wild oranges, known as 'Voasary', are most common on the east coast, growing either near the shore in sandy soil, or more in the interior in compact, more or less flinty rock, but as a rule on poor and arid soil, and are usually scattered amongst bushy growth.

A small lemon about the size of a hen's egg, called 'Voasary mahirana', grows on the north-west coast of the island. On the east coast there are two local varieties of the mandarin orange and one variety imported from Zanzibar, and also an imported variety of grape fruit.

Dr. Haeckel published a list of the different Citrus fruits of Madagascar, giving their native names, but descriptions of the different native fruits are not yet available, and it is difficult to determine to what type they approach, and how many are of the orange and how many of the lemon type, since the Malagasy word 'Voasary' seems to be used generally for fruits of both orange and lemon type.

These names are as follows: Tsoko, Voahangibe, Voangy, Voantsoa, Voasari-kelinandria maintra, Voasari-mahirona (evidently the small lemon above mentioned), Voasari-mamy, and Voasari-mandina.

In the *Flora of Mauritius*, however, Bojer describes a species said to be a native of Madagascar, but cultivated in Mauritius under the name of *Citrus Vangasay*, Boj., and called 'Vangasaille' in Mauritius.

In Mauritius also, a small bronze-coloured orange, a native of China (*Citrus fusca*) appears to be cultivated, but this is not mentioned by Haeckel amongst the Citrus species cultivated in Madagascar.

Until we know whether some of the above-named wild Madagascar Citrus fruits have a bronze skin, it is not possible to guess further at the exact botanical source of the curious bronze orange imported into this country. But the long list of wild forms in Madagascar show that there may possibly be species yielding essential oils that might become useful articles of commerce. (*The Perfumery and Essential Oil Record*, April 20, 1915.)

IMPROVING LOCAL CORN VARIETIES.

The Antigua *Sun* for May 20, 1915, contains a report of a meeting of the Antigua Agricultural Society, at which, a paper on the above subject was read by Mr. T. Jackson, Curator of the Botanic Station. The greater part of this paper is reproduced in the following article:—

Maize breeding can be roughly divided into two sections; firstly, the raising of new hybrids, and secondly, the improving of existing varieties.

The work of raising new varieties necessitates an intimate knowledge of the laws governing plant breeding, without which much time and labour might be wasted without real progress being made.

On the other hand, the improvement of existing varieties is a far simpler proposition, and possibly more immediate good would accrue from this than from the other. In consequence, it is proposed to deal with methods which could be adopted if serious attempts were made to improve our local corn.

It can be stated without much fear of contradiction, that the corn grown in Antigua is a combination of types or varieties which through being grown for many years in the island has adapted itself to local conditions and become thoroughly acclimatised.

It might not be out of place to discuss the selection of corn as performed by some managers on estates. This, as is well known, consists of picking by inspection from the storeroom the largest ears of corn for planting purposes. This is better than planting from the first cob to hand, and possibly more good has been done by this simple operation than is generally realized. It may also be the foundation for the adoption of better methods in the future. The drawbacks to this may be summarised by saying that it is analagous to the breeding of stock from unknown sires.

It is realized that planters on some estates may not have the time at their disposal to devote to an elaborate method of maize selection, but if the above points are considered, it will be seen that a very simple method might be adopted on all corn estates which would eliminate some of the faults of the present system. This would consist of detasselling a certain number of the plants bearing the most promising looking ears, and saving the ears borne by them for seed purposes.

A great many faults could be found with this, but it would be better than the present practice, and there will be the possibility of getting the increased yields often obtained from first generation hybrids.

We may now consider methods which would be adopted if this work were taken up seriously. In the first place the ears which will form the first plot would have to be found. These should if possible be obtained from a field which possesses a low proportion of poor ears so as to ensure a good strain on the paternal side. The plants which bear the ears for planting should be selected for the following points:—

1. General vigour of plant.
2. Size and position of ear.
3. Compactness of husk.
4. Freedom from disease.

Each plant should be marked and the final selection done in the office.

We will presume that sixty ears have been obtained. The seed from each ear is then planted in a separate row. When these arrive at the flowering stage half of them are detasselled and it is from these rows that seed for future future planting is reserved. When ripe the seed from the thirty rows is weighed separately, and the fifteen giving the highest yield are retained. From each of these, four of the best ears are saved, which again give sufficient to bring the progeny plot up to the original sixty rows.

Before going any further, several points in the preceding paragraph might be explained. It will be seen that by reserving for planting purposes only the seed from emasculated plants, there is no danger of self-fertilization. The reason for the new system is to prevent close pollination or the pollination of silks by pollen from tassels grown on the same ear. One other point might be mentioned and that is, when weighing the ears from the various rows the number of plants growing in the row must not be forgotten. In other words, the selection of a row must depend on the average weight of corn borne per plant. The new points might be done by more inspection, but it is more satisfactory if actual measurements and weights are taken.

The following are the main points taken into account:—

1. Length and circumference of cob.
2. Shape of ears and distance between rows.
3. Proportion of corn to cob.
4. Shape of kernels.

The length of a good ear of Antigua corn is about 10 inches. The circumference should be three-fourths of this taken about one-third of distance from the butt. The shape of the ear should be cylindrical with narrow divisions between the rows.

The divisions should not be more than $\frac{1}{8}$-inch wide. The proportions of cob to corn should not be less than 85 per cent., and the minimum number of grains should be between 800 and 900.

As to the grain itself, the length should be about one and a half times the width, and should be wedge shaped.

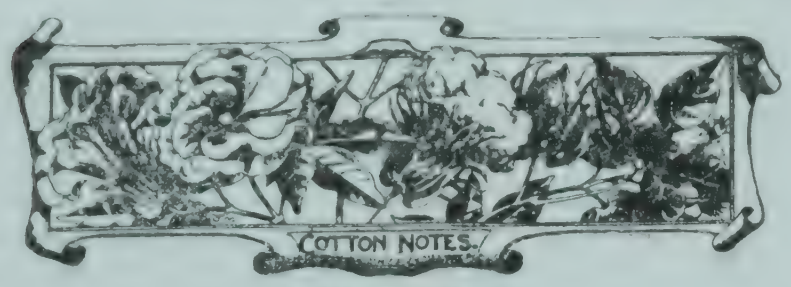
One other point might be mentioned, and that is the weight of grain in individual ears. It must be remembered that selection is performed not merely to obtain large ears, but to obtain ears giving large weights of grain. Therefore it will be necessary to weigh the corn from each ear before deciding which to discard. This factor is influenced by the length of the individual kernels.

To sum up, there is :—

1. A selection of ears from a field bearing good ears of corn.
2. The actual planting of the progeny plot, which should if possible be situated in a field in which there is growing only pedigree corn.
3. The detasselling of alternate rows in the progeny plot.
4. The obtaining of the ears from half of the number of rows giving the highest yield.
5. The selection of the best ears from the fifteen rows giving the highest yield.

It might be pointed out that there is a limit to seed selection, and that after a certain point is reached and undesirable characters are eliminated, further improvements can only be made by introductions of new varieties.

The observations relating to staple crops forwarded from St. Lucia at the beginning of this month show that the cacao crop was finishing while the lime crop was just about to ripen. As might be expected, the sugar crop was nearly over. It is stated that the yield has been good in the valleys but short in the dry districts.



COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under dates May 17 and 31, 1915, respectively, with reference to the sales of West Indian Sea Island cotton:—

Since our last report (May 3) about 100 to 150 bales of West Indian Sea Island cotton have been sold, chiefly St. Kitts 16*d.* to 16½*d.*, and Barbados 14½*d.*

There is still very little demand and this industry is much disorganized, owing to the war in Northern France.

Since our last report (May 17) about 60 bales of West Indian Sea Island cotton have been sold, chiefly St. Vincent at 17*d.*, with a few Montserrat at 14½*d.*

There is very little doing, but prices are comparatively steady.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended May 29, is as follows:—

The market has remained very quiet. There is some inquiry which resulted in sales of only 5 bales (portion of a crop) on private terms. The unsold stock consists entirely of Planters' crops classing Extra Fine and held at 25c. to 30c.

There being no odd bags the quotations for graded cotton are omitted.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, and Manchester, up to May 29, 1915, were 103 and 1,819 bales, respectively.

UTILIZING COTTON STALKS.

At Greenwood, Miss. (U.S.A.), a pulp mill with a capacity of 50 tons daily is being erected to manufacture pulp for paper-making from cotton stalks, a hitherto unused by-product of the cotton fields.

This industry is of vast economic value to the cotton-growing sections of America, as well as of great value to the paper-making trades at this time of increasing scarcity in pulp-making materials the world over.

The cotton plant is a well-known annual plant, the stalks of which, after producing its crop of cotton, have been destroyed by the farmer in preparing his ground for the succeeding crop. A conservative estimate of the annual supply of cotton stalks in the cotton-growing sections of the United States is about 75,000,000 tons. If but 25 per cent. of this can be utilized, it will aggregate an approximate production of 6,000,000 tons of paper annually, worth more than £10 per ton. As there appears to be an inexhaustible supply of cotton stalks that are useless for any other purpose, it ensures a 'raw material cost' of little variation from year to year. Usually about 10,000 cotton plants are grown on an acre of ground. In the Yazoo Delta section the growth of the cotton plant is large, often attaining a height of 8 feet, 10 feet, and 12 feet, the stalks of which in a dry condition weigh from ¾ lb. to 3 lb. each.

The best cellulose for durable papers will be obtained from the fibre of the cotton plant. This particular fibre is a thin-walled tube which collapses in a peculiar twisted manner in the beating process, interlaces in the felting process much better than any other fibre, and holds its grasp tenaciously. It is strong, flexible and durable, of light weight, and with double the tensile strength of stock used in ordinary wrapping paper.

Paper made from cotton-plant fibre, when nitrated, becomes an efficient and convenient form of smokeless powder.

Chemical works will also be erected at Greenwood in which to conserve and refine the by-products produced, which will be of much value in arts and manufactures.

Large quantities of old cotton stalks are being delivered at the mill site, the cost delivered being about 12*s.* 6*d.*, or $3 U.S. currency, per ton. The daily consumption of stalks will be 150 short tons, which will produce 50 tons of valuable pulp.

The mill located on the Southern Railway at Greenwood, Miss., is the first commercial pulpmill of its kind ever erected, and the industry has promises of surpassing the present importance of the cotton oil industry in America.

The process and details for manufacturing pulp and paper from cotton stalks were worked out, and the value of the product demonstrated in an experimental plant at Philadelphia, Penn., with the result that it was decided to construct a commercial and permanent plant at Greenwood, Miss., U.S.A. (*Journal of the Royal Society of Arts*, May 7, 1915.)

Botanical Notes.—An interesting abstract appears in the *Journal of the Royal Horticultural Society* for April 1915, dealing with the Botanic Gardens at Rio de Janeiro. It is stated that great improvements have been effected at Rio during the short time that Dr. Willis (formerly of Ceylon) has been in office as Director. Quite apart from artificial improvements, the gardens at Rio are naturally some of the finest in the world. Adjoining is a forest slope which has been taken over by the Brazilian Government for the cultivation of useful trees, but the work of clearing is rendered difficult owing to the rapidity with which the jungle growth develops. The extraordinary richness of the flora in and around Rio is shown by the fact that no fewer than 11,000 species are known from the Federal area in which the city is situated. Though forest trees predominate in the gardens themselves, there are open spaces where European and tropical flowers flourish bedded side by side as in an English park; but the great features are the palm avenues, the bamboo plantations, fine groups of *Ravenalia madagascariensis*, very fine collections of Cycads and Conifers, and many others including tropical aquatics.

A second note on climbing bamboos, in the same journal, gives some interesting field observations on Arthrostylidium and other climbing bamboos of Porto Rico. *A. sarmentosum* is described as a very graceful and delicately beautiful species, and is found hanging from the long limbs of the trees. It was observed to be in full flower on December 2, 1913. Another species, *A. multispicatum*, has the slender, naked, growing ends of the culms beset with short, sharp prickles. These long grappling branches swing in the breeze like a whip lash until they strike a hold. These branches are freely produced and form an entangled mass that is said to draw blood at every step of one's progress through it.

PRODUCTION OF AMMONIA AND NITRATES IN HAWAIIAN SOILS.

Bulletin No. 37 of the Hawaii Agricultural Experiment Station contains the following summary of the results obtained from an investigation into the occurrence of ammonification and nitrification in the soils of that territory:—

(1) The pasture and forest lands of Hawaii, the soils used for aquatic crops, and most other island soils not subjected to frequent tillage contain very small amounts of nitrate but considerably larger amounts of ammonia.

(2) The uncultivated soils are capable of supporting vigorous ammonification of dried blood, but are toxic to nitrification.

(3) Nitrification takes place in Hawaiian soils after aerated conditions have been maintained for a period of several months, but not immediately following tillage. Ammonification is also stimulated by tillage.

(4) The inactive state of nitrification in the uncultivated soils is not due to the absence of the nitrifying organisms or acidity.

(5) Sterilization in the autoclave and burning failed to bring about conditions favourable to nitrification, but burning caused a splitting off of large amounts of ammonia.

(6) The beneficial effects to crops produced by burning refuse is probably due in considerable part to the formation of ammonia.

(7) The plants growing on the uncultivated soils probably absorb nitrogen largely in the form of ammonium compounds.

(8) Partial sterilization of Hawaiian soils stimulates ammonification for a short time, usually about two weeks, followed then by a retardation in ammonification. Nitrification is inhibited temporarily by partial sterilization, but later on regains its activity, due possibly to reinoculation with air-borne organisms.

(9) Reinoculation of the partially sterilized with untreated soil did not overcome the stimulation to ammonification, but stimulated nitrification.

(10) A permanent increase in the available nitrogen (nitrate and ammonia) was effected by partial sterilization in certain soils, while in others the effects were very temporary. In the latter instances it is possible that nitrate and ammonia consuming organisms gained the ascendancy toward the close of the experimental periods, and that ammonification was partially inhibited by the too great accumulation of the products of bacterial action.

(11) Two-tenths per cent. of toluol and carbon bisulphid were equally as effective as 4 per cent.

(12) It is believed that both the aeration and partial sterilization of Hawaiian soils bring about stimulation in bacterial action through effects produced on the colloidal soil films, but continued aeration in the more effective. The protozoan theory appears to be of doubtful application to these soils.

(13) Calcium carbonate produced considerable stimulation in the ammonification of dried blood and soy bean cake meal in certain soils; in others, only slight effects. Magnesium carbonate, on the other hand, produced marked stimulation in a number of instances. In two soils only, magnesium carbonate was toxic to ammonification. Dolomitic and calcareous limestones produced effects similar to those produced by calcium carbonate.

(14) In certain soils calcium carbonate stimulated nitrification, while in others no effects were produced. Magnesium carbonate, on the other hand, was toxic to nitrification in a majority of the soils studied.

(15) Nitrification was found to be equally as active in the manganiferous and titaniferous soils as in the other soils studied, but magnesium carbonate was especially toxic in these soils, and was more toxic to the nitrification of soy bean cake meal than of dried blood.

(16) Dolomitic and calcareous limestones produced similar effects on nitrification, bringing about stimulation in the soils in which calcium carbonate produced stimulation and no effects in the soils that were unaffected by calcium carbonate.

(17) The application of calcareous and dolomitic limestones will probably produce similar effects on the availability of nitrogen in Hawaiian soils, but regarding the effects of the burnt limes, further experiments are necessary before conclusions can be drawn.

(18) Positive conclusion can not be drawn concerning the effects of the lime-magnesia ratio on ammonification and nitrification in soils. The evidence to date, however, points to the probability that this ratio exerts very little, if any, influence on bacterial action in the usual soil. The concentration of magnesium salts in the soil moisture, on the other hand, probably has an important influence on bacterial action.

(19) The experiments recorded in this bulletin emphasize the importance of maintaining the best aeration possible. This can not be done profitably without the rotatiou of crops, including green manuring. The exceedingly high clay content of much of the cultivated lands causes the soil to be very heavy, and to pack after rains, so that aeration becomes poor. By increasing the humus content aeration will be increased, drainage facilitated, and bacterial action stimulated. Thus, the plant food will become more available, deeper rooting of crops be encouraged, and their ability to withstand the effects of drought be greatly increased. No system of soil management in Hawaii can be judicious or permanent without the rotation of crops and the maintenance of humus.

The storage and application of pen manure has been studied recently in Germany with interesting results. The main conclusion drawn is that to obtain the maximum benefit, the solid and liquid excreta should, on the estate, be utilized separately. The reasons for this are so obvious that one is surprised that they have not been pointed out earlier. Firstly, the two manures are essentially different in their effects: for example, the nitrogen in urine acts as rapidly as that in sulphate of ammonia, whereas the solid excreta's effect is very much slower. The value of the solid matter depends largely upon its high bacterial content, and its richness in humus-forming organic substances. Urine, on the other hand, is relatively poor in bacteria and humus-forming substances, but as already pointed out, rich in quickly available plant nutrients. It is suggested that urine should be more commonly applied to the soil along with absorbents, like peat moss. Further information on this subject may be obtained from the reference given in the English *Journal of the Board of Agriculture*, for May 1915.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

In the editorial in this number the scope of agricultural engineering is explained by means of a review of the Transactions of the American Society of Agricultural Engineers.

On page 194 will be found reviewed the recently issued Report on sugar-cane experiments in the Leeward Islands, 1913-14.

Three articles in this issue deal with various aspects of soil chemistry. The most important article is that which describes recent work in this subject, on page 205.

Insect Notes deal principally with locusts in Trinidad and Venezuela; while Fungus Notes comprise an account of the cause of citrus canker.

Fine Cotton Spinners' Dividend, 1914-15.

According to the *Manchester Guardian* for May 12, 1915, the dividend statement of the Fine Cotton Spinners' and Doublers' Association for the 1914-15, shows that there has been an appreciable decline in the profits. This is said to have been anticipated by everybody. The company, however, has a reserve fund of £1,175,459, and the directors feel justified in the circumstances in repeating the dividend of 8 per cent. which they paid for each of the last six years, although their doing so necessitates the reduction of the balance forward from £256,311 to £134,868.

Particulars as to the French mill and the results of the working of the Mississippi cotton estate are likely to be given later, either in the directors' report or in the Chairman's speech at the meeting.

As to the financial stability of the Association, it might be mentioned that the gross profit in 1911-12 was £637,967, in 1910-11 £641,845, in 1909-10 £673,220, and in 1908-9 £493,317.

The Nature of West Indian Patois.

The interesting description by Mr. C. F. Condelle of St. Lucia patois referred to in a gleaning on another page of this issue, begins by noting that this language in St. Lucia is nearly identical with that spoken in Martinique, Guadeloupe, Trinidad, Dominica, and the country districts of Grenada and, which is more curious, the far distant island of Mauritius. The writer points out, however, that West Indian patois differs much more from good French than the English of the lower classes in such places as Barbados or Antigua does from good English. In the latter case the difference is not greater than, if as great as, the difference between good English and the various county dialects. The essential point is that a Frenchman could not understand a patois-speaking St. Lucian, whereas, of course, an Englishman could readily understand a non-patois speaking individual.

The article goes on to compare the French and the patois equivalents of different English sentences. The following is an example: *Où allez-vous?* (Where are you going?) is *Cotè ou ka alè ?*, in patois.

Patois, it is pointed out, possesses a peculiar kind of conjugation with *kai* (futurity or prospective time) and various other words of a similar nature. It is interesting to note that the sound of *z* is generally placed before a French noun beginning with a vowel, due to the French liasion. For the definite article is commonly substituted an '*â*' (French) after the noun, probably from the French '*ce-(chien)-là*'. Several English words have been adopted into patois, e.g., boy, slate. 'Little boy come here' is '*Ti boy, vien icite*'. The origin of some of the words used is doubtful, but are thought to be of Spanish or more often of African origin.

Finally in addition to patois there is a curious usage of 'Jargon', as it is called. Jargon speaking can be applied to English as well as to patois. It consists of inserting the sound of *p* with the assonate vowel sound between the syllables. When spoken fast, jargon is quite incomprehensible to the uninitiated. An example will explain this best: I gave you three shillings—*Ap I gay-pay youpou threepee sheepileepings*. This extraordinary kind of school-boy language appears to date back a long way, probably to the times of slavery.

In concluding this note we may briefly but seriously refer to the economic importance of eliminating patois as much as possible from the labouring population, for the simple reason that it renders their administration more difficult, and is a serious obstacle to the advancement of education.

Ceylon's Coco-nut Trade.

A very complete account of the coco-nut industry in Ceylon appears in the *Tropical Agriculturist* for March 1915. According to the latest statistics, the extent of the area in Ceylon cultivated with tea amounts to 409,500 acres valued at £16,000,000; that of rubber to 240,500 acres valued at £12,025,000; whereas the area under coco-nut palm is estimated at 800,000 acres, which may be valued at £40,000,000. A good feature about the Ceylon coco-nut industry is that it is almost entirely in the hands of the local people. An outstanding feature is also the variety of products of the palm which Ceylon exports. These include, copra from the dried kernels, coco-nut oil from the copra, desiccated nut, poonac or oil cake, and coco-nut fibre and yarn. Copra, however, is the chief product shipped, amounting to nearly 21,000,000 tons in 1914. The article goes on to say that the cost of manufacture of copra is very small and many of the planters are against the use of costly machinery in place of the simple and economical process now obtaining in Ceylon. Experience in Ceylon is against the use of elaborate machinery. As regards desiccated coco-nut, it is of interest to point out that Ceylon practically monopolizes the world supply of this food product.

Finally in regard to fibre and yarn it is pointed out that hitherto much of this has been sent to Germany and that the Secretary of State for the Colonies has suggested the advisability of setting up brush manufactories in Ceylon with a view to supplying the British market, which has hitherto been catered for by the German manufacturer.

The Dyeing Industry and the Tropics.

What should be an encouragement to indigo growers is the statement made in the current issue of *Tropical Life* that the production of blue serge cloth is likely to be seriously restricted through the scarcity of synthetic dye. Blue serge is an almost indispensable material, and the best quality has always been that which has been dyed with the natural rather than the synthetic colour. It is apparent that in present circumstances indigo planters in India and Ceylon have a good opportunity for coming again to the front, especially since an effort is being made to get the British Government to render compulsory the employment of the natural product in the manufacture of serge for the Royal Navy. A good deal has of late appeared in the press concerning natural dye cultivation in England, and a gleaning dealing with this will be found in this issue. The fact remains that a sufficiently large supply to have any material influence in the present crisis cannot be forthcoming from England itself, owing to the almost complete absence of organization. In the tropics, on the other hand, very considerable orders for some kinds of dyes can and have been placed, and one of these might certainly be natural indigo. According to *Tropical Life*, to repeat what has already been said, blue serge must pass away unless a greater quantity of natural blue dye is to be quickly forthcoming.

Prussic Acid Content of Sorghum.

The influence of the soil on the prussic acid content of plants is a subject of much interest in the West Indies in connexion with cassava, *Phaseolus lunatus* (coloured Lima beans) and other plants. The following results (especially par. 1,) are in accordance with those obtained by Brunnich and Treub. On the other hand, Scurti and Tommasi in Italy found that the addition of nitrates, in the case of beans, reduced the prussic acid content:—

'(1) When sorghum is grown on poor, infertile soil, added nitrogen may slightly increase the amount of hydrocyanic acid in the plant. With a fertile soil and abundant nitrogen this effect may not be produced.

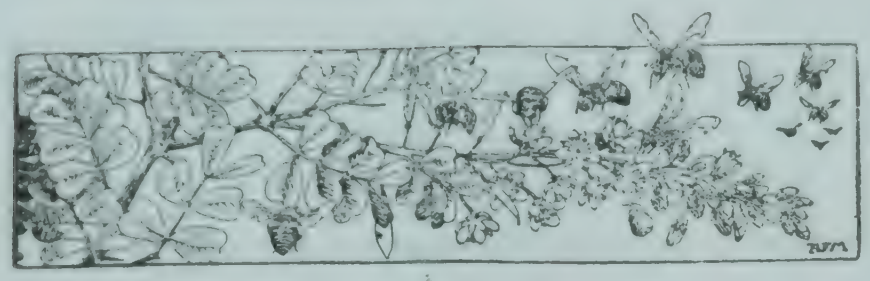
(2) During the first three or four weeks of the plant's life the prussic acid is concentrated in the stalks. Then it rapidly decreases and disappears there, but apparently persists in the leaves in decreasing percentages until maturity.

(3) Climate and variety may be more important factors than soil nitrogen in determining the amount of the acid in the plant.

(4) Complete hydrolysis of the glucosid is obtained by digesting the macerated tissue for two hours at 40° to 45° C.'

The paper on which these conclusions are based will be found in the *Journal of Agricultural Research*, for May 1915.

It may be mentioned that an article is appearing in the forthcoming issue of the *West Indian Bulletin* which deals with the question of prussic acid formation in different strains of beans; and it is shown that the presence of the poison depends on the variety rather than on the soil.



INSECT NOTES.

LOCUSTS.

According to the Trinidad newspapers the recent outbreak of locusts in Venezuela, although not as severe as one which was experienced in 1885, is of considerable proportions. The fears that the flying adult locusts might invade Trinidad appear to have been justified, since specimens of this insect were taken at Chacachacare in that island on May 30, when large swarms began to arrive at that place.

The insect concerned in this outbreak and invasion is the South American migratory locust (*Schistocerca paranensis*). A related form, *Schistocerca pallens*, is the common grasshopper in these islands, whilst another species, *Schistocerca americana*, is the abundant and sometimes seriously injurious locust of the Southern United States.

Mr. W. G. Freeman, Assistant Director of Agriculture, and Mr. A. E. Collens, Assistant Government Analyst, visited Venezuela to study the conditions under which the attack was occurring in that place, returning to Trinidad on the day following that on which the swarms of locusts were observed arriving in that colony.

It was found that in Venezuela the locusts readily attacked leaves of the coco-nut, Palmiste and gru-gru among the palms, and corn, beans and peas appeared to be acceptable foods; banana and the Anauca Immortel were also attacked. Cacao, coffee, Saman, and the Bucare Immortel trees were not eaten; tomato and Guinea grass were likewise left untouched. It is mentioned as a noticeable fact that the locusts avoid the shade, settling and feeding on plants which are in full sunlight.

In anticipation of an invasion by this insect, the Board of Agriculture issued Circular No. 13 by Mr. F. W. Urich, Entomologist, giving information in regard to the life-history of these insects and the means which would be likely to be of value in controlling them. The following is extracted from the circular.

The swarm of invading locusts will consist of winged adults of both sexes. These feed voraciously, and the females deposit the eggs in the ground. In about three months the eggs should hatch and the young appear. The young are wingless 'hoppers' which feed actively and require another three months or thereabouts to complete their development.

The locusts, both young and adult, may be killed by means of arsenical poisons, and for this purpose sprays of arsenate of lead, arsenate of soda and a poison bran mash are recommended.

The arsenate of lead is used for this purpose at the rate of 4 lb. to 50 gallons of water, and it is suggested that 4 lb. of stone lime should be slaked in the water.

The arsenate of soda mixture is prepared by boiling together until dissolved 1 lb. white arsenic, 4 lb. washing soda in 1 gallon of water; water should be added to make up for that lost by evaporation during the boiling.

This is a stock solution: for use as spray, slake 2 to 3 lb. stone lime in 50 gallons of water and add 1 pint of stock solution and 1 gallon of molasses.

These two spray mixtures are to be sprayed on to the food plants when the adults or the young are feeding.

The poison bran mash is made as follows:—

Paris green or white arsenic	2½ lb.
Bran or pollard	50 lb.

These are mixed dry.

Six lemons, sour oranges or limes chopped up fine, rind and all, 1 gallon of molasses and 5 gallons of water are thoroughly mixed together, and when needed for use, i.e., the same day it is to be applied, stir the bran and arsenic mixture into this.

This poison is scattered on the ground where the locusts are feeding. It should be applied early in the morning so that the locusts may have a good opportunity of eating it before the sun dries it up. This poison bait, flavoured with fruit juice, has been very successful (often destroying as many as 90 to 95 per cent. in one application,) in the United States, and should prove useful in Trinidad.

In dealing with an outbreak of locusts it is necessary to destroy as many of the adults as possible to prevent the laying of eggs, as far as this may be accomplished. The destruction of the eggs by ploughing or forking the ground where this can be done will further reduce the numbers, and when these methods are followed by a determined attack on the newly hatched 'hoppers', a very fair degree of control ought to result.

The Pink Boll Worm.—According to Current Notes in the latest issue of the *Journal of Economic Entomology*, a general conference was held on December 18, at Washington, to consider the danger of the introduction of the pink boll worm into the United States. The concensus of opinion expressed was that the present situation demands a quarantine against all foreign lint, with a provision for the importation of such cotton only in States outside of the cotton belt. It was also proposed that such southern mills as require foreign cottons be allowed to obtain it from stocks which have been in storage in the northern localities for at least a year's time.

A Cricket Predaceous on Termites.—'During a flight of termites (*Termes lucifugus*, Rossi) at Manhattan, Kansas, on October 6, 1914, a common field cricket (*Gryllus pennsylvanius*, Burm.) was observed feeding on the termites as they emerged from the ground. The cricket was between two of the holes from which the termites were emerging and was devouring one termite after another. During the fifteen minutes that the cricket was under observation it caught and devoured eleven termites.' (*Journal of Economic Entomology*, April 1915.)

The Agricultural Superintendent, St. Lucia, visited Soufrière during May and held a meeting at the Court House in connexion with the Soufrière Agricultural Credit Society. One of the objects of the meeting was to ask the Administrator to appoint a Chairman to succeed the late Mr. Kennaway. Great interest was displayed during the course of the meeting, and many of the general public were present in addition to every member of the Society. It is believed that with careful guidance and more capital this society could be rapidly extended.

VETERINARY NOTES.

ANIMAL CARRIERS OF ANTHRAX.

The nature of the disease known as anthrax is sufficiently well known to render unnecessary its description in the present article. It is the intention in the following paragraphs to outline an interesting piece of investigation work conducted by Dr. W. H. Dalrymple, of the Louisiana State University (*American Veterinary Review* for December 1914) into the ways in which the disease may be disseminated by different mammals, birds and insects.

The investigator had long been under the impression that infection is spread through the activities of certain carrion feeders on account of their periodic contact with anthrax carcasses during seasons which afford favourable climatic conditions for the development of the infection on areas where the disease had already existed and where strict sanitary measures were not carried out. New areas and fresh foci of infection, and a wider general occurrence of the disease could not be accounted for in the absence of carriers that could move from place to place and thereby extend the territory of infection.

This led to the systematic work now under review. The subjects used in the tests were: the turkey buzzard (*Cathartes auro*), the carrion crow (*Catharista atrata*), the dog, pig, cat, opossum (*Didelphys virginiana*), and the common fowl. The term 'buzzard' is used to include both the turkey buzzard and the carrion crow, as they frequently scavenge in company. The experiments were conducted in a wire-screened room, with concrete floor and walls. Buzzards were confined in roomy cages the bottoms of which were covered with heavy wrapping paper. After feeding the paper was removed from the floors and the cages repapered, and the fæces collected from the cages as soon after dropping as possible. Anthrax spores were used in three different ways: namely, (1) fed in meat balls which were thoroughly infected; (2) through infected carcasses of rabbits: (3) injections of suspensions of anthrax spores made directly into the crop.

A large number of cultures were prepared from the fæces, but not a single anthrax colony could be found.

Not succeeding in finding infection in the fæces, cultures were made from the contents of the digestive tract. Several buzzards were fed spores by the methods just described and the birds destroyed at different periods after feeding (from four to twenty-four hours), with a result that no infection was found beyond the stomach, and but little in that organ.

These experiments would seem to show that anthrax bacteria do not pass through the digestive tract of the buzzard, and are therefore not disseminated in the droppings of this bird.

In order to test the question of mechanical distribution of the infection through the contaminated feet and beak of the buzzard, anthrax carcasses of rabbits were fed permitting the bird to devour them as it would under natural conditions. At different periods scrapings were taken from the feet and beak, and cultured. As long a time as forty-eight hours after feeding and cleansing the cages, virulent anthrax was obtained from both feet and beak. In the state of nature, however, it is possible that the infection would not be found after so long a time, as it would most probably have been washed off or otherwise removed.

Buzzards are gluttonous feeders and frequently throw up much of what they have swallowed. Having found infection in the stomach contents, it was thought likely that the vomitus might contain the organisms and become another source from which the disease could spread. Two hours after feeding on the anthrax carcase of the rabbit, a buzzard emitted a large amount of the flesh, which was carefully collected and cultured and colonies of anthrax developed on every dilution plate used. These results would seem to indicate that the buzzard is capable of carrying infection for long distances, and of creating fresh foci in pastures new.

It may be stated here that a consequence of the above results has been the repeal, in the Southern United States, of existing laws for the protection of the buzzard or the enacting of legislation for the bird's extermination.

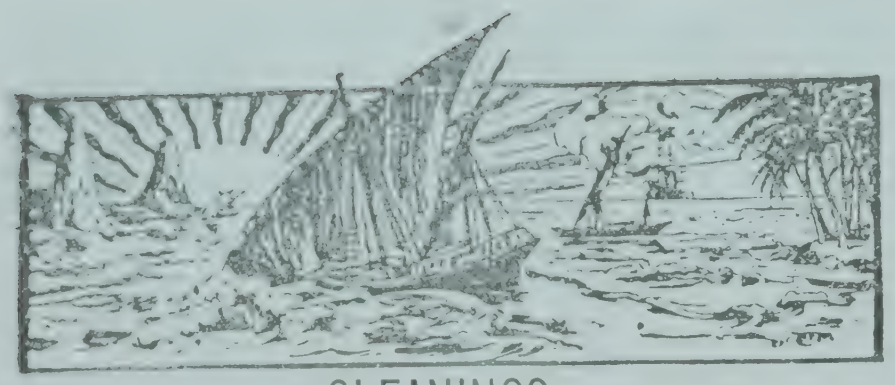
Experiments conducted with dogs, swine and cats showed that infection will pass through the body and that, in consequence, the excreta of these animals may be a source of infection. In regard to the common fowl anthrax was found in the posterior part of the tract, and the fæces contained anthrax infection for forty-eight hours after the spores were fed. In the case of swine, infection was found in the excreta no less than five days after feeding the infection.

The writer of the paper then turned his attention to insects, particularly horse flies (Tabanids) as agents in the distribution of this disease. The writer is of opinion that in Louisiana, the earlier cases of anthrax in a season result from the ingestion of infection; while the later ones, and a greater and more rapid spread of the disease is brought about through the agency of infected flies. Owing to the semi-aquatic life-history of the tabanids, it should not be difficult by means of drainage and other sanitary methods to keep them more fully under control.

The writer strongly recommends systematic vaccination against anthrax and regards the single- and double-dose vaccine as being equally effective; though it is stated that three weeks to one month must elapse before immunity is secured, which when obtained should last for one season of ten or twelve months. Satisfaction is expressed in connexion with the decision of the United States Government to supervise the preparation of vaccines. Apparently some of these have not been prepared in as pure a manner as they should have been in some of the American commercial laboratories.

Lastly, the writer gives attention to the question of the spread of anthrax in infected hides. This is a matter which affects the West Indies commercially, and the quarantine regulations imposed by the United States are in a general way well known. Hides may be disinfected in several ways, but the three accepted by the United States Government are immersion in bichloride of mercury (1 to 1,000 solution); immersion in 5 per cent. solution of carbolic acid; and by exposing to the fumes of sulphur dioxide. Readers who are especially interested in the question of hide disinfection should refer to the *Journal of Agricultural Research* of the United States Department of Agriculture, which deals with special aspects of this subject. Reference may also be made in regard to the preparation and disinfection of hides, to the *Agricultural News*, Vol. XII, p. 247, and Vol. XIII, p. 167.

A notice appears in *Nature* (May 13, 1915) in regard to the Reading Courses and Examinations conducted by the Imperial Department of Agriculture for the West Indies. This notice is based on the recent Circular issued by this Department containing a revised book list and a slight alteration in the syllabus in regard to crop subjects. It would appear that *Nature* considers these courses serve a useful purpose, and are worthy of imitation in other parts of the world.



GLEANINGS.

According to the *Journal of the Royal Society of Arts* for April 30, the Indian rice harvest for 1914-15 was estimated at 284,125,351 quintals of husked rice as against 292,522,979 quintals in 1913-14. The yield of cotton was 9,492,752 quintals as against 9,189,733 in 1913-14.

From information received from Turks Island we understand that the so-called summer season has now begun, and lobster canning, sponging, and sisal hemp factories are in full swing. It is reported that a capitalist wishes to start the bêche-de-mer industry. These animals are found plentifully in the waters around the Caicos.

Most of the important grasses and forage plants of Hawaii are described in *Bulletin No. 36* of the Agricultural Experiment Station in that territory. The forage crops which are poisonous or otherwise undersirable are mentioned in tabular form, and these include Johnson grass (*Andropogon halepensis*), the guava, the castor bean, and *Tephrosia purpurea.*

In Venezuela increased attention is being given to the collection of chicle gum owing to the falling off of exports to the United States of this product from Mexico. Chicle is stated to offer considerable advantages over balata in the Bolivar province, from the point of view of the collector, as the trees can be found much nearer the centres of distribution. (*Bulletin of the Imperial Institute*, Vol. XIII, No. 1.)

The average yield of maize in various countries during 1910 is shown in tabular form in the *Journal of the Department of Agriculture of Victoria* for March 1915. Canada heads the list with 57 bushels per acre, following which there is a big drop to 34 bushels in the case of Egypt. The average yield for the United States is given as 26·58 bushels, while that of Russia is only 19·73 bushels.

As a result of the increased demand for dyes, the *Fruit, Flower and Vegetable Trades' Journal*, for April 24,1915, and May 1, 1915, publishes two articles which give an account of the leading sources of vegetable colours. Most of these refer to plants that grow in England; but indigo, logwood and gambier are also mentioned, as well as the cochineel dye. It is noted that the stalks of the common rhubarb were at one time largely used as a source of red dyes for wool.

It is reported in *The Board of Trade Journal* for May 6, 1915, that up to the present no very large quantity of coco-nuts has been exported from Brazil as the supply has only been equal to the home consumption. Coco-nuts to the value of £1,930 were exported in 1912, chiefly to Argentina and Uruguay. It is said that the climate and general conditions of the Brazilian sea-board from Sergipe to Para are quite suited for this cultivation.

One of the most formidable problems which faces the Animal Industry Division of the Hawaiian Agricultural Commissioners is the periodical outbreaks of cerebro-spinal meningitis among equine stock. Considerable losses result also from hog cholera, and the *Hawaiian Forester and Agriculturist*, for April 1915, says that the control of this disease would not appear to be as effective as possible.

The Barbados *Standard* for June 11 reproduces an article from the St. Vincent *Sentry* describing the report on Dr. Hovey's recent visit to the crater under the auspices of the American Museum of Natural History. Dr. Hovey has revised some of the altitude measurements. He also finds there is no seepage of water from the crater, nor are there any signs of volcanic activity anywhere. The volcano seems to be absolutely quiet and as safe as it was for ninety years before 1902.

A concise account of agricultural education in St. Lucia will be found in that number of the Imperial Education Conference Papers, Section III, dealing with the Colony in question. This includes a short history of the agricultural school and a statement of the position of the agricultural department in relation to the primary schools. A very interesting appendix (F) is attached to this report, consisting of an article on St. Lucia patois by Mr. C. F. Condelle, late Inspector of Schools. This latter receives further attention on another page in this issue.

There is an increased demand in Great Britain at present for boxwood, which in former years was supplied from around the Black and Caspian Seas. Several substitutes for true boxwood have, however, been introduced, and one of these, the Knysma boxwood (*Gonioma Kamassi*) has been exported in considerable quantities from South Africa. A species of true Boxus is also found in some parts of South Africa. The Imperial Institute has accordingly suggested to the Union of South Africa Government that it would be well to meet the present demand as far as possible. In passing it might be asked whether Dominica and other West Indian islands might not be able to do something in connexion with this present enquiry for hardwoods. Further information on the present subject will be found in the *Chamber of Commerce Journal* for May 1915.

Foot-and-mouth disease, which forms the subject of *Farmers' Bulletin No. 666*, United States Department of Agriculture, is not known to occur in the West Indies, being principally a cold country disease. It has been recorded, however, in the Philippine Islands, and it is believed that there is no considerable part of the Orient free from it. The recognition of the disease is not difficult. The combination of high fever, vesicular inflammation of the mouth, and hot, painful, swollen condition of the feet followed twenty-four to forty-eight hours later by the appearance of numerous blisters varying in size from that of a pea to that of a walnut on the udder and feet and in the mouth should prevent any serious or long-continued error in the diagnosis. Foot and-mouth disease is transmissible to man, and is altogether one of the most highly communicable diseases that we have to contend with.

RECENT WORK IN SOIL CHEMISTRY.

Three numbers of the *Journal of Agricultural Science* for September and December (1914) and March (1915), respectively, have been received, and the following notes have been abstracted, containing interesting information concerning the latest work that has been done in England in regard to the bigger problems of soil chemistry. In making this selection it has been endeavoured to bear in mind the possible application of the results in a general way in the West Indies.

The soil solution and the mineral constituents of the soil is the subject of an important paper by Mr. A. D. Hall, Dr. Brenchley, and Miss Underwood. The soils of fields at Rothamsted which have been under cultivation in one crop for a large number of years were examined, and the work included the growth of plants in soil water obtained from the samples. It is concluded that the composition of the natural soil solution as regards phosphoric acid and potash is not constant, and varies with the composition of the soil and its past manurial history. The growth of a plant is largely influenced by the concentration of the nutritive solution, irrespective of the total amount of plant food available. On normal cultivated soils the growth of crops like wheat and barley, even when repeated for sixty years in succession does not leave behind in the soil specific toxic substances which have an injurious effect upon the growth of the same or other plants in that soil.

Another important piece of investigation in the second number of the journal referred to, deals with the evaporation of water from soil. Mr. B. A. Keen, the author, has found that the evaporation of water from soil fractions like sand and silt, and from China clay as well as from ignited soil, is a relatively simple phenomenon; but the evaporation from soil is more complex, something being present which operates in making the relation between the soil and the soil water of a different and closer nature than in the case of sand. The effect is not due to soluble humus, and it is concluded that the phenomenon is principally due to the colloidal properties of clay. The rate curves for soil evaporation are examined mathematically in this paper, and it is thought that a second factor must be taken into consideration, namely, the effect on evaporation of the decreasing water surface in the soil.

One of the chief lines of research conducted at Rothamsted is the study of soil gases, and Mr. Appleyard in collaboration with Dr. Russell publishes a lengthy and important paper on the subject in the March number of the journal. The free air in the spores of the soil to a depth of 6 inches is very similar in composition to the atmospheric air, but it differs in two respects: it contains more carbon dioxide and correspondingly less oxygen, and it shows greater fluctuation in composition. The dissolved air in the soil consists mainly of carbon dioxide. Fluctuations in composition of the free soil air are mainly due to fluctuations in the rate of biochemical change in the soil; and these fluctuations are seasonal. Grass land usually contains more carbon dioxide and less oxygen than arable land, but we cannot attribute the difference to the crop owing to the large differences in soil differences and conditions. There is no evidence to show that the crop increases the percentage of carbon dioxide in the soil, and such weather conditions as barometric pressure, wind velocity, variations in temperature from the mean, small rainfall, etc., seem to have but little influence on the soil atmosphere.

One of the most interesting contributions to the same number of this journal is a paper on soil protozoa by Mr. Andrew Cunningham. This paper was prepared at Leipsic and was published in Germany last August, but as no copies could be procured in England owing to the war, the paper was republished in the *Journal of Agricultural Science.* During the last year or two, particularly in America, Russell's discovery of soil protozoa as a factor of fertility has been subjected to considerable criticism. It is interesting that Cunningham's paper, based on research in Germany with Professor Löhnis, supports the conclusions of Russell. It is stated at the end of the paper: 'the reduction in bacterial numbers in the soils inoculated with protozoa is very marked, and lies well outside the limits of experimental error. The conclusion may safely be drawn, therefore, that the limiting factor or at least one limiting factor (of Russell and Hutchinson) has been inoculated into the sterilized soils and has produced its effects on the numbers of bacteria. . . . Large numbers of protozoa were observed in the solutions used for inoculation and these organisms were cultivated once more on soil extract from the soils which showed low bacterial counts. And as it has been shown that the protozoa are capable of reducing the numbers of bacteria in solutions, it appears justifiable to consider them as the limiting factor in soils.'

The Value of Soil Analysis.—The following is the advice given by Dr. E. J. Russell in the *Journal of the Board of Agriculture* (May 1915), in regard to the value of soil analysis to the farmer:—

'The farmer who wishes to derive the maximum assistance from soil analysis must bear the following points in mind:—

'1. The simplest problem for the expert is to compare soils, and, therefore, the chances of success are greatest when a soil survey has been made, or when some similar soil has been under proper field experiments.

'2. The object of the analysis is to furnish information, but no one has the time, even if he had the power, to set out all that he can discover about a particular sample of soil. The farmer must, therefore, arrange to go over the land with the expert and discuss on the spot the various points on which information is desired; the necessary samples can then be drawn with the proper tools, and with all due precautions.

'3. Finally, it should be remembered that the problem is very difficult indeed when no satisfactory standards exist, and where the expert has not made a personal inspection; so much balancing of probabilities has to be done that no expert can give more than a general opinion or do more than submit two or three alternative schemes for consideration and trial.'

Cable advices from the Federated Malay States Government to the Malay States Information Agency state that the export of rubber from the Federated Malay States for the month of March last amounted to 3,418 tons, as compared with 3,411 tons in February, making the total for the three months 10,302 tons, as against 7,324 tons, in the corresponding period of 1914. (*Chamber of Commerce Journal*, May 1915.)

An American consular report states that the production of cacao in the Guayaquil district of Ecuador amounted to 92,213,874 lb., the value, at an average price of 16 centavos ($0·078) per lb., being $7,192,682. The 1913 crop was 85,908,495 lb., valued at $7,452,014. The lower prices in 1914 were due to the European war. Returns for the other parts of the Republic have not been received from the customs office, but they will not materially increase the above figures. (*Chamber of Commerce Journal*, May 1915.)

FUNGUS NOTES.

THE CAUSE OF CITRUS CANKER.

In the current volume of this journal, on pages 14, 46, and 62, information was given on the subject of Citrus canker, a new and extremely virulent disease of Citrus trees, especi lly grape fruit, which has appeared in the United States. H E. Stevens, in *Bulletin 124* of the Florida Experiment Station, attributed the disease to a fungus of the Phoma or Phyllosticta type, on the strength of two infections obtained, amongst a number of negative results, by spraying with a suspension of spores from pure cultures.

In the *Journal of Agricultural Research*, issued by the U.S. Department of Agriculture, Vol. IV, No. I, dated April 15, 1915, appears a preliminary report on the subject of Citrus canker, by Clara H. Hasse, Scientific Assistant in the Bureau of Plant Industry. The author has isolated a bacterial organism, which she names *Pseudomonas citri*, which is claimed, on what appears to be unimpeachable evidence, to be the originating cause of typical canker.

The following paragraphs are quoted from the report in question:

'The inoculations were made on young, healthy, vigorously growing grape fruit seedlings, which were kept in the laboratory because the highly infectious nature of the disease made it impossible to carry on the experiments in the Department green-houses. Pure cultures of the organism were mixed with sterile distilled water, and the suspension thus obtained was placed upon the upper and under leaf surfaces by means of a sterile pipette in such a manner that the leaves were, for a short time at least, covered with a film of the inoculating fluid. The main stem and branches were treated in the same way. In some cases the leaves and stems were punctured with a sterile needle, but this is not necessary, as infections may be obtained without this procedure. As soon as the plants were inoculated they were placed under bell jars and kept at a temperature of about 86°F. Under these conditions the organism takes a vigorous hold on its host, and in three or four days evidences of infection can be noted. At the end of a week definite, well defined cankers which penetrate the tissue of the leaf have been formed. Owing to the stimulating influence which the organism has upon the infected leaf tissue, there is a rapid development of cells, and the tension resulting from the abnormal growth quickly ruptures the epidermis and exposes the soft, spongy, underlying canker tissue, which is distinctly visible on both sides of the leaf. The cankers produced by artificial inoculation present a characteristic appearance, and closely resemble natural cankers in macroscopic as well as in microscopic features. They penetrate the tissue of the leaf and are more or less raised on both the upper and lower surfaces. The outline is circular, and there is a sharp, distinct demarkation between the canker and the surrounding normal leaf tissue. Young cankers have a soft spongy structure and at first show a light-green colour, which later turns red-brown. The cells in the canker tissue become suberized and produce a corky growth, which is a symptom of the disease. This open, spongy type of canker is the result of rapid growth due to favourable conditions of temperature and moisture.

'While the canker is still soft and young, the organism is in a very active condition and can be isolated very readily. Upon teasing out a small piece of canker tissue in a drop of sterile water, motile bacteria in great numbers ooze out and give the water a milky, turbid appearance. The motility of the organism can be most satisfactorily observed by means of a dark-field illumination. The organism was re-isolated from these cankers by plating out on beef agar, and was found to be identical with the original organism. Inoculations on grape fruit plants with the organism obtained from this re-isolation produce characteristic cankers.

'The open surface of the canker and the spongy character of its structure afford an excellent lodging place for spores of all sorts, and it is not surprising to find fungi, some of which may perhaps play a minor part in the later stages of the disease. A number of fungi have been isolated from old Citrus cankers, and a study of their relation to the canker problem shows that the fungus flora of the Citrus canker perhaps may be an interesting problem in itself.'

AGRICULTURAL AFFAIRS IN ST. KITTS.

A large and representative meeting of the St. Kitts Agricultural and Commercial Society was held on Tuesday, May 18, 1915, to meet Dr. Francis Watts, C.M.G., Commissioner of Agriculture for the West Indies. His Honour the Administrator presided at the invitation of the Vice-Chairman of the Society, and introduced Dr. Watts to the meeting, paying a high tribute to the work of the Imperial Department in these islands.

Dr. Watts, on rising, explained the functions of the Imperial Department of Agriculture. By means of the valuable literature and information that passed through their hands they were able to supply information on most agricultural matters. The Commissioner pointed out that agricultural societies were a useful means of disseminating information, and other functions of such societies were also briefly referred to.

The subject of Cotton was then dealt with, more especially in connexion with the guarantee from the Fine Spinners of a minimum price for fixed types of cotton during the season 1915-16. Dr. Watts pointed out the interest the British Cotton Growing Association had taken in this matter, and thought that it was entirely due to their action that this minimum price had been guaranteed. Types of cotton had been fixed, and in the telegram received, St. Kitts and St. Vincent had been referred to as a standard at 18*d.* per lb., and other islands at 14*d*; but it was his opinion that these standards would be according to fixed types of cotton, so that it would be possible for cotton from any island to secure the higher price if it was up to standard.

Dr. Watts carefully pointed out the distinction that existed between the British Cotton Growing Association and the Fine Spinners, the latter being the sole purchasers of our cotton, and a large wealthy combine. The British Cotton Growing Association purchased no cotton and, as in this case, protected the interests of the cotton grower. Extracts from correspondence were read by Dr. Watts illustrating this.

St. Kitts standard of cotton was due to soil and climate, but the Commissioner strongly advised attention to selection of seed so as to keep up the high quality of the lint. The best safeguard in the West Indies was the insular position which formed a barrier to infection from outside sources.

He was assured that there would be a great demand in the near future for West Indian cotton.

Turning to the Sugar Industry, Dr. Watts remarked on the present flourishing condition, the war having been responsible for a rise in prices. He compared the prices of last year with those of this year, and pointed out there was little need for any depression with sugar at these prices and cotton at a guaranteed price of 18*d.* per lb.

He advised planters to deal more liberally with their lands especially in the application of pen manure, as he regretted to see signs of falling off in some places. In returns of cane per acre the Factory weighbridge was a factor they had to reckon with, and by keeping accurate records they could see their deficiences and remedy them.

In regard to food or provision crops, maize was a useful and valuable one, but with the good prices of sugar and cotton in St. Kitts, Dr. Watts thought that it would only be advisable to plant sufficient for local use. Corn was the largest crop grown in the United States and none was exported. At the present time the corn imported into the West Indies was Argentine corn, and he saw no reason why these islands should not grow all the corn that they needed.

Dr. Watts then dealt with such crops as Lima beans, and showed what a profitable crop they were. California was instanced as having an area of 85,000 acres in Lima beans, and the wholesale price was 4c. per ℔. In Canada where there was a small duty the price was 8c.

Onions were also referred to as a paying crop, and it was suggestive that inquiries had lately been made from New York as to why St. Kitts did not export onions as well as Antigua.

He was glad to see some extension in the planting of coco-nuts. There were tracts of land in St. Kitts most suitable for them, and the object-lesson of the coco-nut cultivation at Pinneys estate, Nevis, was a valuable one.

Another industry to be considered as a paying one was pig raising. There was a great demand for pork and bacon, and pigs could easily be raised in these islands. It was a matter for future consideration. The subject had been fully dealt with in the *West Indian Bulletin*, Vol. XIV, No. 4.

Dr. Watts was next asked for some expression of opinion on a Scheme for the erection of a Factory for sugar in the northern districts of St Kitts. He thought that the erection of a factory in the district would be the best scheme, but that would cost about £90,000. An alternative scheme was to raise a loan through the Government and lay down a railway line connecting the two ends of the present factory line. That would cost about £30,000. They could then make terms with the factory for the payment for their canes. He advised the formation of a small committee to prepare proposals for raising the money, etc. He was of opinion that after the war was over the attitude of the Government towards sugar would change.

The Administrator also was sure that the Government would do all in its power to assist in the erection of such a factory or railway line.

Some discussion then took place on factories generally, and the results of the Basseterre Factory were discussed.

A vote of thanks was then proposed to Dr. Watts for his interesting and valuable address, and after an expression of appreciation was made to His Honour the Administrator who is retiring from office, the proceedings closed.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of April:—

The occurrence of the Easter holidays in the early part of the month of April has been answerable for a quietness in the tone of the markets during the first week, from which, however, it recovered later, and has been maintained since, both in the number of buyers and in the quantities of goods that have changed hands. One point that has been noticed is the entry amongst buyers of France and Russia, for some chemicals and drugs. The following details are those affecting West Indian products.

GINGER.

A generally firm tone has prevailed for all kinds of ginger throughout the month. At auction on the 22nd it was stated that new crop Jamaica would be small and that higher freights and fewer sailings were to be expected, and would tend to keep up prices. In the early part of the month Sierra Leone was quoted at 25*s.* per cwt., and towards the close at 25*s.* 6*d* to 26*s.*

NUTMEGS, MACE AND PIMENTO.

At auction on the 14th nutmegs were in good supply, 504 packages of West Indian, and 77 packages of Java being brought forward and sold, the former at the following rates: 58's 1*s.*, 64's to 74's 5*d.* to 8½*d.*, 76's to 86's 5*d.* to 5¾*d.*, 87's to 97's 4½*d.* to 5¼*d.*, 98's to 108's 4*d.* to 4¾*d.*, 110's to 120's 4½*d.* to 4¾*d.*, 130's 3¾*d.* to 4¾*d.*, 155's 4¼*d.* to 4½*d.* The prices realized for the Java consignment were as follows: 66's 8*d.*, 96's 4½*d.*, 108's 4*d.*, and 120's 4¼*d.* A fortnight later, namely on the 28th, nutmegs were again in good supply at similar rates. Mace, at auction on the 14th, was represented by 130 packages of West Indian, all of which sold at an advance of from 2*d.* to 4*d.* per ℔. on previous rates, realizing 1*s.* 2*d.* to 2*s.* 8*d.* per ℔. for good West Indian, and 10*d.* to 1*s.* 7*d.* for broken. Twenty-nine packages of Eastern partly sold at 1*s.* 10*d.* to 2*s.* 1*d.* per ℔. A fortnight later, namely on the 28th, 49 packages of West Indian were brought forward and sold at the following rates: Fine pale 2*s* 8*d.*, ordinary 2*s.* to 2*s.* 2*d.*, common 1*s.* 11*d.*, and broken 1*s.* to 1*s.* 1*d.* At the first spice auction on the 14th of the month, 200 bags of fair Pimento were offered and all bought in at 2⅛*d.* per ℔. A week later the quotation was from 2*d.* to 2 1/16*d.*

SARSAPARILLA.

At auction on the 15th, sarsaparilla was represented by 12 bales of grey Jamaica, 22 of Lima-Jamaica, and 3 of native Jamaica, all of which were disposed of, the grey Jamaica fetching 2*s.* to 2*s.* 1*d.* per ℔. for fair fibrous, the Lima-Jamaica from 1*s.* 6*d.* to 1*s.* 8*d.*, and for the native Jamaica 1*s.* 1*d.* per ℔. was paid for mixed reddish and yellow, and 10*d.* for ordinary pale yellow.

ARROWROOT, CITRIC ACID, LIME OIL, LIME JUICE, KOLA, CASSIA FISTULA, AND TAMARINDS.

Towards the end of the month it was stated that some 1,500 barrels of arrowroot had recently been disposed of, fine manufacturing fetching as much as 4*d.* per ℔., good 2¾*d.*, and common to fair 2*d.* to 2½*d.* per ℔. Throughout the month citric acid has been steady at 2*s.* 6*d.* per ℔. The market in West Indian distilled lime oil was reported at the beginning of the month to be practically cleared, small quantities only being obtainable up to 3*s.* 6*d.* or even 3*s.* 7*d.* per ℔. At auction on the 28th of the month 4 casks of West Indian lime juice were offered and sold at 2*s.* 7*d.* per gallon. On the 15th, kola was in good supply, being represented by 4 bags of fair dried West Indian halves, which fetched 3¼*d.* to 3⅜*d.*; 1 bag of good bright realized as much as 5*d.*, while 21 bags of Java consisting of small, part dark to fair bright quarters and halves, sold at 2*d.* to 3¼*d.* In the early part of the month Cassia Fistula pods were quoted at 27*s.* 6*d.* with the prospect of an early advance. At the same period East Indian tamarinds were fetching 19*s.* 6*d.*

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, June 1, 1915.

ARROWROOT—$2\frac{3}{4}d.$ to $4\frac{1}{4}d.$
BALATA—Sheet, 2/4½; block, 1/11½ per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 82/- per cwt.; Grenada, 73/- to 79/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—West Indian, £23 15*s.* per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, $14\frac{1}{2}d.$ to $17d.$
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Jamaica, 55/- to 70/-.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 3/- to 3/3; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations
MACE—$9d.$ to 2/11$d.$
NUTMEGS—$4\frac{1}{4}d.$ to $5\frac{3}{4}d.$
PIMENTO—$1\frac{7}{8}d.$ to $2\frac{1}{16}d.$
RUBBER—Para, fine hard, 2/7¼; fine soft, 2/2¼; Castilloa, 2/-.
RUM—Jamaica, 3/- to 3/8.

New York.—Messrs. GILLESPIE BROS., & Co., May 26, 1915.

CACAO—Caracas, 14c. to 15c.; Grenada, 15c. to 15½c.; Trinidad, 14½c. to 15½c.; Jamaica, 12⅞c. to 13¼c.
COCO-NUTS—Jamaica, selects, $25·00 to $26·00; Trinidad, $26·00 to $27·00; culls, $15·00 to $16·00.
COFFEE—Jamaica, 8c. to 12c. per lb.
GINGER—10c. to 13c. per lb.
GOAT SKINS—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 39c. to 42c. per lb.
GRAPE FRUIT—Jamaica, $1·75 to $3·00.
LIMES.—$8·50 to $11·00.
MACE—48c. to 52c. per lb.
NUTMEGS—11c. to 12c.
ORANGES—Jamaica, $1·75 to $2·50.
PIMENTO—3¾c. per lb.
SUGAR—Centrifugals, 96°, 4·89c.; Muscovados, 89°, 4·24c.; Molasses, 89 , 4·12c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., May 31, 1915.

CACAO—Venezuelan, $14·50 to $15·00; Trinidad, $17·52 to $18·24.
COCO-NUT OIL—75c. per Imperial gallon.
COFFEE—Venezuelan, 11c. per lb.
COPRA—$4·00 per 100 lb.
DHAL—$7·50.
ONIONS—$4·00 to $4·25 per 100 lb.
PEAS, SPLIT—$12·00 per bag.
POTATOES—English $2·25 to $2·50 per 100 lb.
RICE—Yellow, $6·00 to $6·25; White, $6·25 to $6·50 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. T. S. GARRAWAY & Co., June 14, 1915.

ARROWROOT—$4·00 to $4·50 per 100 lb.
CACAO—$16·00 per 100 lb.
COCO-NUTS—$16·00.
HAY—$1·90 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $82·00 per ton.
MOLASSES—No quotations.
ONIONS—$2·75 per 190 lb.
PEAS, SPLIT—No quotations; Canada, $5·40.
POTATOES—Nova Scotia, $4·00 per 160 lb.
RICE—Ballam, $6·00 to $6·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, no quotations.

British Guiana.—Messrs. WIETING & RICHTER, May 29, 1915; Messrs. SANDBACH, PARKER & Co., April 30, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	—	$10·00
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	15c. per lb.	16c. per lb.
CASSAVA—	96c. to $1·20	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$10 to $15 per M.	$20 per M.
COFFEE—Creole	——	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	——
Liberian	10c. per lb.	13c. per lb.
DHAL—	$8 25	$8·25 per bag of 168 lb.
Green Dhal	——	——
EDDOES—	$1·20	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	5c. per lb.
Madeira	——	——
PEAS—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	—	——
PLANTAINS—	16c. to 48c.	——
POTATOES—Nova Scotia	$2·70	$2·75
Lisbon	—	——
POTATOES—Sweet, B'bados	$1·68	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50
TANNIAS—	——	——
YAMS—White	——	——
Buck	$2·64	——
SUGAR—Dark crystals	$3·75 to $3·85	$3·75
Yellow	$4·25 to $4·35	$4·25
White	—	——
Molasses	$3·10 to $3·25	——
TIMBER—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Alcohol as Fuel in the Tropics.

PERSISTENT agitation, during the past two years, in favour of alcohol as a source of power in the tropics, does not appear to have resulted so far in the achievement of anything definite. Several well-known authorities on sugar manufacture have advocated the utilization of molasses in this direction, and have shown that the proposition is a practical one; other writers have called attention to the value of the by-products on banana, cacao and coco-nut estates; while in sub-tropical countries the cultivation of corn and starch-producing crops has been mentioned as another source from which alcohol might be produced.

In this journal (No. 310 of March 14, 1914,) the whole question of alcohol production in the tropics was reviewed, and authorities were quoted to the effect that the supply of petrol is diminishing, and that even engineers and oil specialists were viewing with concern the neglect on the part of the agriculturist to begin producing a substitute. This journal furthermore published information to show that with very little modification, the ordinary oil engine can be satisfactorily run on alcohol, and it was concluded that sugar-producing countries, at least, should manufacture enough alcohol as a source of power for local consumption. In making this suggestion it was pointed out that there is nothing essentially new or novel in the employment of alcohol. As is well known, the whole of the Prussian State Railways are lighted by alcohol, and as long ago as 1901 a not inconsiderable business had developed in Mauritius in connexion with public lighting, and domestic lighting and cooking with alcohol. It is only going one step farther to use this spirit in place of petrol for transport.

Nöel Deerr's views on the economic side of the subject were reproduced in this journal last April (Vol. XIV, No. 333). This authority calculates that from the present Cuban sugar crop, 100,000,000 gallons of molasses are produced, from which under modern methods of fermentation and distillation 40,000,000 gallons of alcohol might be obtained, worth 23 cents per gallon. Peck, in Hawaii, has strongly advocated alcohol production in that territory, and he has calculated that 100 tons of cane will yield 1,058 lb. of absolute alcohol. The cost of production is mentioned as being negligible since, according to Peck, the value of the residue as a fertilizer leaves the alcohol as a by-product free of cost. Referring to a recent report by the Committee on the Utilization of Megasse and

Molasses (Hawaii), reproduced in this journal for September 26, 1914, we find it estimated that allowing 10lb. of alcohol a day for each one of the 1,500 automobiles in Hawaii, an annual consumption of 1,800 tons is indicated. A similar consideration applies to the West Indies.

One of the latest contributions to the alcohol-as-fuel question is by Mr. T. H. P. Heriot, in the *Journal of the Society of Chemical Industry*, Vol. XXXIV, April 15, 1915. This writer gives a large amount of data concerning the quantity of alcohol yielded from molasses (both cane and beet), and the cost of production. Beet molasses has about the same value as cane molasses as regards the quantity of alcohol obtained therefrom. An interesting table given in this paper is the Distillery Balance Sheet, prepared by Antoni, of Hawaii. A 5,000-acre estate is taken as an example, producing 12,500 tons of sugar and 350,000 gallons of molasses, during a crop season of 175 days. The distillery has to treat 2,000 gallons of molasses a day. Fuel is the chief expense, but a profit is shown of $22,500 at the end of the crop.

An important source of revenue is the so-called fertilizer syrup, valued at 9 cents per gallon. This contains considerable amounts of potash and nitrogen. Nöel Deerr in the paper previously referred to, values the mineral constituents in the Cuban molasses output at $1,980,000 for potash, and $1,200,000 in the case of nitrogen. The much-discussed question of molasses as a manure seems to find here a satisfactory answer. The sugar in the molasses has little if any beneficial effect upon the soil: the residue, on the other hand, because of its mineral content, is likely to prove very useful as a manure, though it would probably be desirable to improve its consistency by means of the addition of an absorbent like superphosphate, if it were intended for export. In concluding his paper, Mr. Heriot gives the following statement of the cost of producing 95 per cent. alcohol, without recovering the potash and nitrogen, and excluding the cost of molasses itself: 'In the United States 8 cents per gallon, in Demerara 5 cents (exclusive of fuel), in Hawaii 10·2 cents, and in Cuba, 10 cents. The actual working expenses therefore approximate to 5*d*. per gallon.'

On this basis alcohol should be well able to compete with petrol at 28 or 30 cents per gallon, and yield a good profit to the producer. Why then, it may be asked, has it not been tried? There are several preliminary difficulties in the way. There is the excise part of the question: the necessity for producing only uniform spirit, as regards water content; the readjustment of engines to take alcohol; and the conflicting oil interests. Denaturizing should settle the first, and the second and third are merely mechanical difficulties easily overcome by the sugar manufacturer and the engineer. The fourth is only local in its application.

It would seem, in reconsidering the various references quoted in this article, that enough has been written concerning the cost of producing alcohol, particularly from molasses, and that it is time for the carrying out of demonstrations. It might be suggested that Government enterprise would be useful in this direction. If only an experiment on commercial lines were tried with successful results there could be an awakening amongst the three classes of the community involved in the matter: the sugar manufacturer would produce alcohol, the engineer would turn out specially designed engines of maximum of efficiency, and the consumer would buy both. Before this can happen, carefully planned demonstrations must be made in different places. Under ordinary conditions alcohol is not likely to be produced for fuel until its successful employment has been indicated on a practical basis. As already suggested, this might be a matter for Government consideration. The value of commercial demonstrations by the Government is well seen in the West Indies, for example, in connexion with cotton factories, lime juice factories, and corn-drying establishments. It is hoped that this group may soon be extended to include a demonstration of the value of alcohol as a source of power.

SUGAR-CANE VARIETIES IN DIFFERENT COUNTRIES.

A consideration of the distinguishing characters of sugar-cane cultivated at Sabour, in India, constitutes the contents of Vol. VII, No. 2, of the *Memoirs of the Department of Agriculture in India* (Botanical Series).

The chief interest in this paper lies in the fact that it records the results of the first attempts made in India to propagate sugar-cane by the method of pure line cultures. From the information given in the Introduction it is clear that any attempts to obtain reliable results from experiments on the agricultural, botanical, or chemical characters of cane varieties must prove abortive unless pure cultures are used for the experiments. A pure culture is one derived from a single plant.

When once the local varieties had been established in pure culture and the various types isolated, it was possible to undertake accurate work on the study of their distinguishing characters, regarding which very little exact data had previously been collected. There are a large number of

simple field characters by which cane varieties can be distinguished.

Field characters:—(1) number of stems on a stool, (2) average height of canes in field, (3) general appearance of cane, uprightness or otherwise of plant in young or older stages.

Leaf :—(4) appearance such as straight, upright, bent over, etc., (5) proportion of withered leaves to green ones, (6) breadth of leaves at middle, (7) leaf edge, (8) length of leaves, (9) colour of leaves, (10) colour of leaf sheath, (11) colour of band at base of leaf, (12) presence of hairs at leaf base.

Stripped Canes:—(13) general colour of cane, (14) thickness of cane at internodes and nodes, (15) length of internodes, (16) colour above node, (17) colour of internodes, (18) presence of wax and colour of wax, (19) appearance of buds—eyes well developed or not, (20) appearance of canal above buds, (21) have eyes sprouted?

In addition to their obvious use in distinguishing cane varieties, it is hoped that the detailed observations made in regard to the several varieties will prove useful in studying the behaviour of these canes under different climatic and soil conditions, and it will thereby be possible to obtain an idea of the suitability of the various groups of canes for the various cane tracts of India. The results of these observations should also in future provide useful information regarding the subject of deterioration.

Another interesting publication dealing with varieties of sugar-cane is *Bulletin No. 2*, of the Bureau of the Sugar Experiment Stations, Queensland. This publication contains a complete list of the different varieties which have been introduced, principally from New Guinea, but also from Mauritius, Demerara, Trinidad and Barbados. That part of the bulletin which deals with varieties that have been or are now being grown commercially in Queensland makes reference to the well-known Bourbon, Trinidad seedling No. 60, D.1135, B.208, B.147, and D.116. All these canes have proved satisfactory, though D.1135 has shown the greatest promise and has proved its fitness for Southern Queensland's conditions in a marked manner. Fully four-fifths of the cane from Bundaberg south is of this variety. It is stated that in Queensland B.208 is subject to disease. It would seem that some of the New Guinea canes are worthy of attention in the West Indies. N.G.15 is described as a cane with white flesh, highly saccharine, and a remarkably heavy cane weighing 1lb. per foot. It is greatly appreciated by labourers as it is so easily cut, trashed and loaded.

While considering the subject of varieties of cane it may not be out of place to refer to the report of work of the Experiment Station of the Hawaiian Sugar Planters' Association for 1905. In spite of being published ten years ago, this report contains very interesting considerations and figures in regard to the varieties at that time under trial in Hawaii. The following paragraph is quoted to show how the characteristics of the same variety may change after it has been subjected to the soil and climatic influences of various countries:—

'If we endeavour to trace back to their original ancestors our Lahaina, introduced into these islands from the Marquesas Group by Captain Pardon Edwards, and the Otaheite, received from Louisiana some years ago, it appears that they came from the same stock. From the coast of Malabar, India, this variety (for they are the same,) was shipped to Réunion, Mauritius, and Madagascar, and from these points it was received by the West Indies and the islands of the Pacific. From the West Indies "Otaheite" was introduced into Louisiana and from Louisiana into Hawaii, while the "Lahaina" came from the other direction and reached Hawaii by way of Marquesas. When brought together at the Experiment Station and grown side by side under the same conditions of soil, climate, irrigation and cultivation, they resembled each other closely, and only differed in their value as to sugar production, and in the diameter of the stick.'

A comparison of the chemical characteristics of these two canes showed that the Lahaina was by far the richer, having a sucrose content of 17·8 against 12·4 in the case of Otaheite.

At the time when the report from which the above paragraph has been taken was published, D. 117 held the lead among the recently introduced varieties, and was regarded as a promising cane worthy of trial under the diversified conditions of the island. B. 147 had also made a reputation for itself, having apparently been obtained in Hawaii by way of Queensland.

AGRICULTURAL AFFAIRS IN BRITISH GUIANA.

On another page of this issue there will be found a review of the 1913-14 Report of the Department of Agriculture of British Guiana, and the information in the present article will serve the purpose of bringing the review more into line with current events.

The information given is based upon the Demerara *Daily Argosy's* report on a recent meeting of the Board of Agriculture, at which Professor Harrison made some very interesting statements in regard to current topics and developments. In the first place the rubber industry was dealt with, and following the statement by Professor Harrison that the price of planting material was to be reduced, His Excellency the Governor urged that more enterprise should be shown in planting the large areas of land suitable for Para rubber. Experiments yielding satisfactory results have been conducted at Issororo, which have shown that rubber can be collected quite cheaply in the Colony, but, that in order to do so, the cultivation must be on a large scale, otherwise the cost of superintendence is too great. Interesting evidence was brought forward to show that, so far, the best rubber in the Colony had been produced at Christianberg.

The census of agricultural industries given in this report show several noticeable increases in the area under crops during 1914-15. The area under rice has increased by as much as 11,454 acres, while maize and ground provisions show an increase of 2,604 acres. Other large increases are to be seen in the case of coco-nuts, coffee and live-stock. The principal decrease has occurred in the case of limes, and it is also observed that there was a large falling off in the number of swine. A table showing the areas devoted to the principal varieties of sugar-cane indicates the great popularity of D.625, on the one hand, and the steady decline of the Bourbon, on the other. D.118 seems to be receiving more consideration at the hands of planters.

In conclusion reference is made to veterinary matters principally in connexion with the outbreak of anthrax on the East Coast. Although a very active campaign has for the past few months been conducted, there are indications that the epidemic has not yet entirely disappeared, and it was moved at the meeting that the restrictions on the East Coast infected area should be continued until three months after the last suspicious case. Professor Harrison referred in conclusion to the epidemic of swine plague and fever which had occasioned considerable loss, but which had now for the time being almost entirely disappeared.

FRUIT.

PAPAW AND PAPAIN.

A very interesting article appears in *The Tropical Agriculturist* for March 1915, dealing with the papaw tree (*Carica papaya*), and the production, properties, uses, and commercial value of the drug papain, which is extracted from the fruit. From this the following useful and valuable information is abstracted.

The papaw tree is a familiar object in many parts of the tropics, being commonly grown in gardens and around native houses, or occasionally cultivated in small areas near towns for supplying the fruit to local markets. Much has been written regarding the well-known fermentive properties of the tree and its capacity for rendering tough meat tender. The tree is a native of tropical America and the West Indies, and was introduced into Ceylon probably early in the seventeenth century. It is propagated invariably from seed, but its propagation by cuttings and graftings is possible, though seldom practised.

In recent years the papaw has come into prominence on account of the drug papain obtained from the fruit. As to the properties of papain, its peptonising or digestive power is well known, and it is considered a good substitute for animal pepsin; but, unlike the latter, it requires neither the aid of an acid nor an akali to convert the contents of the stomach into a peptone. The celebrated chemist Varequelin compared papain to 'blood deprived of its colouring matter'. The material has not, however, come into extensive use in medicine, its consumption at present being cheifly confined to America, where it is much used in the treatment of chronic dyspepsia, gastritis, diphtheria, etc., and it is also recommended for ecxema. In Ceylon it is said not to be used medicinally, except perhaps in native medicine. It is described, however, in Waring's *Indian Pharmacopœia* and Dymock's *Materia Medica of Western India*. Papain has the effect of curdling milk, like rennet, and might be used as a substitute for the latter. The demand for papain is, of course, limited, and the present supply appears to come almost entirely from Ceylon and the West Indies, more especially the island of Montserrat.

As regards the trade in the drug, it is mentioned that the export of papain from Ceylon is in the hands of a few firms who buy from the villagers in the interior, mostly in the districts of Kurunegala and Kegalle, and pay from about Rs. 5 to Rs. 7 per ℔. The purified commercial papain fetches round about 12*s.* (Rs. 9) per ℔. in the European markets. According to a tabular statement of the exports from Ceylon, it is seen that the following were, in quantities and value, exported to the countries named, in 1913: United Kingdom 12,705 ℔., value Rs. 44,185=£2,945 13*s.*; Belgium 376 ℔., value Rs. 1,181=£150 8*s.*; Germany 2,555 ℔., value Rs. 12,705 = £847; United States of America 2,912 ℔., value Rs. 13,078 = £871 17*s.* The United States is said to be the largest consumer, importing annually, it is estimated, to the value of £15,000 to £16,000. The price paid in the States for papain varies from 7*s.* 6*d.* to 15*s.* per ℔., according to quality, as tested to determine its digestive properties. According to *The Chemist and Druggist*, the demand for papain at present exceeds the supply, as the American importers insist on a high-coloured papain, which is difficult to procure.

The fact is recalled that some time ago Jamaica maintained an industry of some importance in collecting and preparing the juice for the market, but it has now shrunk to negligible proportions. Later, from 1889, the business grew up in the Island of Montserrat, which became the chief producer in the West Indies. Doubt is expressed, however, whether the trade is likely to increase. Prices have fallen considerably in recent years, but within the past six months, according to *The Chemist and Druggist*, for January 1915, they have shown a distinct advance.

Opinion among large consumers appears to be divided on the present question of supply and demand, some stating that the consumption of the drug is on the increase and the prospects are good for marketing larger quantities, while others affirm that the only means of extending the market would be in the production of a more carefully prepared product which would replace the cheaper and adulterated grades, of which considerable quantities are sold. Attention is directed to an article on papain in the *Journal of the Royal Society of Arts* (September 1913), in the course of which the statement was made, 'that the United States prefer the inferior qualities from the West Indies, and also desire a white or bleached papain, which the Ceylon natives are not always in a position to supply. Importers, however, could, without much difficulty, procure an almost unlimited supply of the best unadulterated Ceylon papain, if they were willing to pay a slightly better price for it than for the West Indian product, and would accept it in its natural state.' It should be mentioned here that the Montserrat papain, when rapidly prepared, is of a light colour, without the employment of any bleaching agent.

Dr. Huybertsz, of Kandy, who has devoted some attention to the preparation of papain, is quoted as stating that 'European and American importers object to papain in its natural colour, and insist that it be white, or at least, light.' This, he says, is a great mistake, as it can only be obtained by bleaching—a process which sacrifices therapeutic efficiency for pharmaceutical appearance. Genuine papain is slightly saltish and somewhat acrid. It has a peculiar, unmistakable smell, and the 'feel' of granular papain should be crisp, like biscuit, and easily crushed between the fingers. When it is doughy or sticky, it has been adulterated or badly prepared. It has also slight escharotic action, and collectors of the fresh juice frequently blister their fingers. When mixed with water it has a soapy 'feel'. Up to a comparatively few years ago the value of papain was little understood, and it was mostly used in making mucilaginous products and chewing gums. Since then, the United States, Germany, and Great Britain have taken considerable quantities, and it enters into many preparations. Recently, it is stated, America has found a new use for the drug, but what this is, has not yet transpired.

INDIAN CORN.

MAIZE IN RHODESIA.

It is estimated that from 350,000 to 400,000 bags of maize will be available for export from Southern Rhodesia this season. In addition, about 50,000 bags will most likely be exported from Northern Rhodesia. The work of grading will be undertaken by the Government of Southern Rhodesia, and this year the bulk of the maize will be graded at the siding to which it is conveyed by the farmer, and not at Salisbury, as was done last year. This will enable farmers to avoid the consigning of moist or weevilly grain, and the

consequent expense of the higher railage charges made on grain unfit for export. Although the price on the European market is exceptionally high at present, it is feared that the accruing benefit will be largely discounted by the high freights now obtaining as a result of the war. We understand that representations on the subject of freights are being made to the principal steamship companies, and we can only hope that they will not be without effect by the time the export of maize is due to commence.

The following circular letter has been issued by the Farmers' Co-operative Society to members:—

'The business of exporting maize is one of enormous importance to this country, inasmuch as that export is, as yet, the only means by which the producer can find an outlet for this surplus crop. Excellent facilities have been provided by the Beira and Mashonaland and Rhodesia railways, and growers of maize now have the maize markets of the world open to them at export rates which compare favourably with any in the world.

'Maize is a valuable oversea export, and is a source of profit to farmers that can be relied upon. This country is an ideal one for its production, and has a harvesting season that cannot be excelled by any maize-growing country in the world. Maize of exceptionally good quality can be produced in large quantities, and, with excellent export facilities and a ready market in Europe at profitable rates, ought soon to become the leading source of revenue to the country.

'Members are requested to carefully note the following:—

'It is recommended that every member personally superintends the shelling of his maize, and rejects all damaged cobs. Such superintendence will pay.

'Members should see that their maize is perfectly dry before bagging. Drying and rebagging is a costly job; and further, such maize loses the grade certificate and corresponding advantages.

'A SIMPLE TEST. No maize is fit for bagging which shows the germ full and plump. It should be hollow and firm.

'Only 2½lb. grain bags will be passed by the grader. All bags must be new.

'The mouths of bags must be double sewn, with lugs, i.e. the corners strongly fastened and left standing out. This facilitates handling, and loaders will not require to use hooks, which tear the bags and cause loss of weight.

'The weighing of maize should be carefully carried out, and bags must weigh 200lb. net at time of shipment. Members are notified to fill to 205lb. gross per bag to allow for drying out.

'The grade certificate is accepted by the Corn Trade Associations at the various European ports as final as regards quality, but the weight out-turn must be guaranteed by the shipper. Under-weight, therefore, causes unnecessary trouble and expense.

'Members must mark their bags clearly and distinctly with the stencil plate supplied by the Society.

'The consignor must see that railway trucks are in a clean condition before loading maize, and should, as far as practicable, load one grade only in a truck. This facilitates handling at the port. Less handling means less damage to bags, and consequently less short-weight.

'Care must be exercised in loading so that there is no possibility of any bags falling off. Trucks must not be loaded over their carrying capacity, which is marked on each truck.

'The following grades only are accepted by the Society free on rails:—

'1. F. W. 1. To be sound, plump, dry and well cleaned, with a maximum of together 1 per cent. of discoloured or defective grain.

'2. F. W. 2. To be sound, dry and well cleaned, and not contain more than 3 per cent. of defective and 5 per cent. of discoloured grain.'

FEDERAL CORN GRADES, U. S. A.

From information received, it is understood that the following system of classification of Indian corn in the United States came into effect last July 1.

The figures (percentages) represent the maximum proportion of water, damaged corn, etc., allowed in each grade, respectively:—

Grade	1	2	3	4	5	6
Moisture	14·0	15·5	17·5	19·5	21·5	23·0
Damaged corn (exclusive of heat damaged)	2	4	6	8	10	15
(Including heat damaged)	0	0	0	½	1	3
Foreign material	1	1	2	2	3	5
'Cracked' corn	2	3	4	4	5	7

The following constitute the general rules that have to be observed:—

(1) The corn in grades No. 1 to No. 5 inclusive, must be sweet.

(2) White corn, all grades, shall be at least 98 per cent. white.

(3) Yellow corn, all grades, shall be at least 95 per cent. yellow.

(4) Mixed corn, all grades, shall include corn of various colours not coming within the limits for colour as provided for under white or yellow corn.

(5) In addition to the various limits indicated, No. 6 corn may be musty, sour, and may also include corn of inferior quality, such as immature and badly blistered.

(6) All corn that does not meet the requirements of either of the six numerical grades by reason of an excessive percentage of moisture, damaged kernels, foreign matter, or 'cracked' corn, or corn that is hot, heat-damaged, fire-burnt, infested with live weevil, or otherwise of distinctly low quality, shall be classed as sample grade.

(7) In No. 6 and sample grade, reasons for so grading shall be stated on the Inspector's certificate.

(8) Finely broken corn shall include all broken particles of corn that pass through a perforated metal sieve with round holes $\frac{9}{64}$-inch in diameter.

(9) 'Cracked' corn shall include all coarsely broken pieces of kernels that will pass through a perforate metal sieve with round holes $\frac{1}{4}$-inch in diameter, except that the finely broken corn as provided for under Rule 8 shall not be considered as 'cracked' corn.

(10) It is understood that the damaged corn, the foreign material, including pieces of cob, dirt, finely broken corn, other grains, etc., and the coarsely broken or 'cracked' corn, as provided for under the various grades, shall be such as occur naturally in corn when handled under good commercial conditions.

(11) Moisture percentages, as provided for in these grade specifications, shall conform to results obtained by the standard method and tester as described in *Circular 72*, Bureau of Plant Industry, United States Department of Agriculture.

COTTON.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended June 5, is as follows:—

The market remains very quiet with limited inquiry for the Planters' crop lots, which comprise the entire unsold stock, but no sales have been made as the Factors refused to meet the views of buyers.

There being no odd bags in stock, the quotations for graded cotton are omitted.

The crop lots are held at 25c. to 30c.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool, and Manchester, up to May 29, 1915, were 103 and 1,819 bales, respectively.

Mutation in Egyptian Cotton.—According to Mr. T. H. Kearney in the *Journal of the Agricultural Research* (Vol. II, No. 4), the origin of Egyptian cotton is obscure. According to one theory, it is a product of hybridization between a brown-linted tree cotton and American Sea Island, both of these types having been cultivated in Egypt nearly a century ago. Whether or not this be true, there can be no question, says Mr. Kearney, that the varieties now grown are of mixed ancestry, a condition which some investigators regard as favourable to mutation. So far as this scanty evidence goes, most of the Egyptian varieties originated with a mutant, i.e., an individual plant which showed an abrupt and definite change in the characters expressed. This conclusion is supported by the more complete data at hand regarding the history of the varieties which have been developed in Arizona.

Lastly, Mr. Kearney points out the very interesting circumstance that Egyptian cotton exhibits, although in a minor degree, the tendency to develop new varieties by mutation, which characterizes the well-known *Oenothera Lamarkiana*.

BRITISH GUIANA: REPORT OF THE DEPARTMENT OF SCIENCE AND AGRICULTURE, 1913-14.

The fact that Professor Harrison's report comes to hand more than a year after that with which it deals, does not lessen the importance of the large amount of useful information and conclusions which it contains.

In the opening pages mention is made of official changes that have occurred during the year under review. There were two notable events of this nature, consisting in the arrival of Mr. C. K. Bancroft, M.A., from the Federated Malay States, to take up the post of Assistant Director and Government Botanist; and the retirement of Mr. J. F. Waby, Head Gardener, after thirty-five years' service.

Professor Harrison's observations on the general agriculture for the year deal first with sugar. The work in connexion with the raising of new varieties of cane was continued, and in all 9,300 seedlings were obtained. Of these 3,100 were retained at the experimental fields, whilst a large number were distributed to the nurseries of certain sugar plantations. The chief crosses obtained were between D. 118 and D. 145, D. 118 and D. 167, D. 118 and D. 419, D.118, and D.625. A large number of cuttings were distributed to sugar plantations, chiefly from varieties D.118, D.625, D. 721, and D. 167. The average yields and characteristics of the expressed juices from these canes were very satisfactory.

Experiments with nitrogenous manures confirmed the beneficial effects obtained in previous years, and it was again shown that in normal years sulphate of ammonia is preferable to nitrate of soda. Experiments with molasses as a fertilizer showed that no appreciable action on the crops is produced, and the application of this material has resulted in heavy financial loss. Nor has any advantage accrued from attempted partial sterilization of the soil with chlorinated lime, though a good influence was found to be exerted by caustic lime on heavy clay land. The prevalence of disease among the different varieties was noted, and again the Bourbon was found to be the most susceptible variety.

The sugar-cane crop of the colony suffered from the after-effects of the 1911-12 drought. The exports of sugar were therefore low, amounting to 87,414 tons. A reduction was also seen in the case of rum, molasses and cattle food. The campaign against the insect pests of sugar-cane was continued with vigour, and special mention is made by Professor Harrison of the good work done by the sugar estates' proprietors, attorneys and managers.

The next crop dealt with in the report is rice. The area under this cultivation was 33,889—a decrease of 8,035 acres on the area cultivated in 1912. This decrease may be considered to be due mainly to the unfavourable planting weather experienced in May and June, and to the depressing effects of the drought of 1912 on the cultivation of this product in the colony. As regards experimental work, by the removal from the fields of stools exhibiting variation from the type, and by selection of the grain, the varieties are maintained at the high standard of 99 per cent. purity. The paddy is given free of cost to any bona fide rice growers, in quantity not exceeding 60 lb. The work of hybridizing rices has been continued. The hybrids produced in 1911 were thirteen in number; their F_2 generation with the parentage is given in the appended report on the Botanic Gardens. A fresh series of hybridization trials was commenced in 1913; the hybrids will be selfed in the F_1 and future generations, with the object of ascertaining how far the distinguishing characters of varieties are transmissible. This work is in a preliminary experimental stage and no opinion can be expressed as to its probable value. By direction of the Governor, trials have been begun of growing rice under irrigation with artesian water. The crops are to be grown continuously with the object of obtaining five crops in two years, the probable maximum of rice crops in the climate of Demerara. Results will not be available until several of the crops have been reaped.

The cultivation of coco-nuts still remains one of the most progressive industries in the colony. The acreage returns show a further increase from 13,698 acres in 1912 to 14,177 in 1913. There was a considerable increase in the exports of both nuts and copra, but the increase would have been greater still if it had not been for the retarding influences of the 1911-12 drought. Commenting upon the general condition of coco-nut cultivation in Demerara, Professor Harrison says not sufficient attention is being paid to proper drainage and cultivation. Overcrowding is to be noticed on certain estates and the proportion of select coco-nuts is low, and hence the greater proportion of the crop must be manufactured into oil and copra. On neglected cultivations diseases are prevalent, and for the safety of the coco-nut industry a Bill has been passed which became law in August 1914, under the title of Plant Diseases and Pests Ordinance of 1914. The coming into bearing of the varieties of coco-nuts obtained from Singapore, Trinidad and Tobago have afforded some interesting observations. As regards the first-mentioned class, two of these varieties are of promise and their ripe nuts are being used for planting. The Trinidad strains have yielded heavily, the nuts being medium sized. It would appear, however, that plants raised from the colony's coco-nuts are better suited to the local heavy soils. An examination of the specific character of the nuts yielded by different varieties leads to the conclusion that cross-fertilization may take place in a grove, and that plants are by no means likely always to come true to the specific type of their parent palm. Hence in selecting nuts for planting it is advisable not to select from single trees of a desired type, but from trees growing in groups of which all or the major part are of the desired type.

Several pages of information are given concerning the experimental work with rubber, of which the principal plant grown is the Para rubber (*Hevea brasiliensis*). Other horti-agricultural industries referred to are cacao and limes. The last-named crop is regarded as a promising industry, which unfortunately received a set-back by the closing down in 1911 of the citrate of lime factory. The recent installation of two citrate of lime factories in the colony, and the contemplated erection of a factory for lime products at Onderneeming School Farm doubtless will supply the much needed stimulus for this otherwise very promising industry. In regard to pastoral pursuits, reference is made to the increasing number of cattle and sheep, and mention is made of the valuable services rendered by the veterinary staff during the year under review, in connexion with the outbreak of mal-de-caderas. Professor Harrison's report concludes with a review of educational work with which he has been associated for over thirty years.

The remainder of the publication under review (i.e. in space the greater part) consists of detailed reports by the Government Analyst, the Government Botanist, and other members of the staff. In the report on the Botanic Gardens and their work, a useful collection of descriptions of mangoes is to be noted, and some interesting facts concerning the West African oil palm, Nipa palms, Areca palms, balata and ginger lily. The oil palm seeds imported from West Africa germinated very satisfactorily, and more have been ordered. Mr. Bancroft points out that there are two distinct varieties of oil palm growing in the Botanic Gardens, which are easily distinguished by the character of their leaves and fruits. Interest attaches to the ginger lily (*Hedychium coronarium*) on account of its great value as a source of fibre for paper making. This matter was dealt with two years ago in the *Kew Bulletin*, and referred to in the *Agricultural News*. The ginger lily in British Guiana seems to be very particular as to its environment, and will only grow vigorously in a damp situation with a loose soil containing a quantity of organic matter.

A reference of considerable interest is made to the Soya bean—a crop which has not proved up to the present a satisfactory one for the West Indies. It is said that a Soya bean has now been obtained in British Guiana from Venezuela which is presumably well suited to tropical cultivation. If this actually proves to be a thoroughly acclimatized variety, its economic importance will be considerable, and there will be a general demand in other parts of the tropics for samples of seed.

The scientific investigations in this report on the Botanic Gardens and its work principally concern mycology, just as the report of the Economic Biologist which follows, pertains to the investigation of insect pests. The information in these sections together with that in the report of the veterinary surgeon will receive notice in a future issue of this journal, on pages especially devoted to these subjects.

NORTHERN NIGERIA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1912.

Mr. P. H. Lamb, the Director of Agriculture, has forwarded a copy of this report with an expression of regret that its publication has been so long delayed.

The report provides interesting information on several crops which are common to both Nigeria and the West Indies. Mention is made, for instance, of the Bambarra ground nut, and this is considered to be a useful crop for certain districts where the ordinary ground nuts do not flourish. It was first described some three years ago when a small parcel of seed was sent to Kew for distribution to various Botanic Stations in different parts of the world. With reference to rubber, the Director is of opinion that *Funtumia elastica* is not worthy of attention as a plantation tree. Experiments are being started with Para and Ceara.

Turning to cotton, a crop which is more fully dealt with than the others in the report, it would seem that this cultivation can never occupy in Northern Nigeria anything but a position of quite secondary importance owing to the limited growing season during which the land must be reserved for the production of provisions. It is pointed out, however, that if early maturity be made a principal factor in the process of selection, prospects will be improved. The kinds of cotton that exist in Northern Nigeria are interesting: there are four distinct species in cultivation, namely, *Gossypium peruvianum*, *G. punctatum*, *G. obtusifolium*, *G. arboreum*. The first named, is, speaking generally, by far the commonest type, and probably 95 per cent. of the cotton handled by the British Cotton Growing Association consists of this species.

Recent developments in Northern Nigeria of an agricultural nature include the opening of a school farm where important selection work has been started and a considerable number of live-stock installed of good pedigree, including ostriches, cattle, sheep, donkeys and goats. It would appear that developments may follow in regard to developing the forestry resources of Northern Nigeria, for as the Director points out, although Northern Nigeria is not nearly so well timbered as Southern Nigeria, the fact remains that the sylvan products of the Protectorate, namely, wild rubber and gum, represent considerably more than half of the entire exports, with the exception of tin and live-stock.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture' Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number contains a review of recent literature on the alcohol-as-fuel question, and suggests the desirability of demonstrations in some of the West Indian colonies, particularly those in which sugar is the staple product.

Reproduced on page 213 will be found the general rules and grade descriptions of the United States federal corn grades.

The important subject of acidity in soils is dealt with as a note and comment on page 217.

Insect Notes, on page 218, deal with the pests of peas and beans, and Fungus Notes, on page 222, consist of the first article of a series dealing with the internal disease of cotton bolls.

Department of Agriculture, Trinidad and Tobago, 1913-14.

The Report on the Department of Agriculture, Trinidad and Tobago, for the year 1913-14, a copy of which has recently been received at this Office, contains several items of interest. As regards the work of the Botanical Department, amongst other matters taken in hand during the year under review was the clearing, burning and planting up of 2 acres of the lands in the Emperor Valley in Hevea rubber and Robusta coffee, and 1 acre each in Hevea rubber and limes, Hevea rubber, limes and coffee, limes, Sapucaia nuts, and Tonka beans. In connexion with the nursery work at the St. Clair Experiment Station, it is mentioned that 216 lb. of Robusta coffee seed specially imported from the Belgian Congo were readily disposed of. The total amount realized by sale of plants at this station was £450 14*s.* 11½*d.* as compared with £197 12*s.* 2*d.* for the previous year. In addition, plants, etc., to the value of £36 17*s.* 7½*d.* were distributed free, or in exchange.

The Government stock farm seems also to have maintained its efficiency and usefulness, especially in regard to the raising of pigs. The breeds kept are Tamworth, Berkshire and Poland China; during the year ninety-one pigs were sold, realizing $291·82.

The average rainfall for fifty-two years 1862-1913 is given as follows: January 2·84, February 1·56, March 1·90, April 1·91, May 3·79, June 8·09, July 8·87, August 9·81, September 7·25, October 6·65, November 6·92, December 4·71 inches, making a total of 64·38 inches.

America, and Agricultural Engineering in the Tropics.

The Louisiana State University and Agricultural and Mechanical College possesses an engineering department in which a special study is made of sugar machinery. Bulletins have appeared embracing the results of such studies as the efficiency of heating and evaporating apparatus, boiler tests, fuel economy, and similar matters.

During last year the department conducted an investigation in Porto Rico in connexion with heat and evaporation, and, according to the Twenty-seventh Annual Report of the College, the data obtained are of especial value in that they make possible comparisons of the efficiencies obtained in good Louisiana and tropical plants.

In the West Indies, valuable data are on record at the larger factories, but there exists no institution where this can be utilized for educational or investigation purposes. In a recent editorial in this journal it was shown that the subject of agricultural engineering is relatively neglected in the West Indies, and the case of the Louisiana College offers an example of what might be done in these colonies.

While speaking of agricultural colleges in relation to Porto Rico, it might be mentioned that Porto Rico

and the Philippines possess the distinction of being the only strictly tropical countries where agricultural colleges exist. A letter has recently been received at this Office from the Dean, in which is pointed out the advantages the existence of this college offers to men in the British West Indies who desire a scientific and practical training in tropical agriculture. Engineering is taught as well as the usual biological and chemical subjects, and it is possible to specialize in almost any cultivation owing to the varied nature of the crops grown.

Acid Soils.

The studies which are being conducted in India and the Federated Malay States with regard to acidity as a factor of soil fertility are amongst the most interesting of present soil investigations in the tropics. A recent editorial in this journal made reference to the large quantity of lime required to neutralize certain soils in Malaya, and now from that country a publication has been received containing a review of an investigation designed to show the value of lime as an antitoxin.

In Assam, according to the publication under consideration (*Agricultural Bulletin of the Federated Malay States*, Vol. 3, No. 4), it has been found that on untreated soil certain crops consistently fail to survive the seedling stage, but that after the application of lime, normal crops are afforded. Laboratory examination of the soil disclosed the presence of an acid organic compound which is definitely toxic to certain seedling plants. A number of manurial experiments were carried out to see whether the unfavourable factor could be eliminated by different nutrients. It was found that satisfactory crop production was always obtained on those plots to which lime was added. Of all the unlimed plots, the only ones to carry a crop to maturity were those to which basic manures had been added on the one hand, and on the other, four plots in which, superphosphate was the only constant manurial factor.

According to the publication referred to, it seems extremely improbable that this favourable action of lime and the alkaline carbonates can be credited to any common attribute other than that of providing a base and thus diminishing the soil acidity, and probably rendering harmless the toxic compounds which accompany it. As regards the good effect of superphosphate, the explanation is put forward, that this manure probably stimulates root development which, by increased extra-cellular root oxidation, leads to the destruction of the toxic material.

Transpiration of a Partial Parasite, and of Shaded Tobacco.

The above heading indicates the subject of two interesting notes that appear in the *Experiment Station Record*, Vol. XXXI, No. 4. From these it appears that experiments with a mistletoe (*Loranthus pentandrus*) on *Mangifera indica* in Java, have shown that the daily loss of water per unit area or leaf surface of the parasite is about 50 per cent. greater than that of the host, the difference being at a maximum during the hotter part of the day, owing, presumably, to the observed better control of the stomata by the host. The same general relation was observed in the case of another mistletoe growing on guava. The high rate of evaporation is considered to explain the desiccation and death which sometimes occur of that part of the host beyond the location of the parasite.

The second note referred to concerns the effect of shading on the transpiration and assimilation of the tobacco plants in Cuba. The transpiration of plants grown in the open was nearly 30 per cent. greater than that of the plants grown under cheese-cloth shade. Shading of tobacco plants did not seem to result in a diminished production of total plant substance as compared with other plants not shaded. As the leaves of the shade-grown plants had a greater total area than those of plants in the open, the quantity of plant material elaborated per unit of leaf area was greater in the plants grown in the open. As regards the influence of shade on the deposition of material, it was found that in the shade-grown plants, relatively less material was deposited in leaves and more in the stems than in the corresponding organs of the plants grown in full light.

It may be added that the question of the effect of shade upon plants was dealt with editorially in the *Agricultural News* for May 8, 1915. Experiments with tobacco have been conducted in St. Kitts, and it has been suggested that a similar trial should be made to test the effect of shade upon sugar-cane.

West Indian Bulletin.

The contents of the current issue of the *West Indian Bulletin* (Vol. XV, No. 1) comprise several articles of interest. The first dealing with the development of agriculture, is based upon and in part consists of the addresses of Mr. A. D. Hall, F.R.S., delivered before the Agricultural Section of the British Association—Australian Meeting 1914. These addresses have been published in the Bulletin with Mr. Hall's special sanction. The second paper also deals with agricultural development, but with special reference to the industries of Montserrat. In this article Dr. Watts gives an interesting review of the progress of events in the Presidency. In this number of the Bulletin also appear two short articles by Dr. H. A. Tempany dealing with the island of Redonda, and the feeding and manurial value of lime seeds, respectively. Finally, two articles appear concerning the poisonous forms of Lima beans, by Mr. W. R. Dunlop, and skin diseases of cattle in Antigua—a paper compiled from the notes of Mr. P. T. Saunders, M.R.C.V.S., formerly Veterinary Officer to this Department.

With this issue of the Bulletin is sent out the title page and index to Volume XIV. Readers are now advised to have Volume XIV bound.

INSECT NOTES.

PESTS OF PEAS AND BEANS.

In a recent number of the *Agricultural News* (see issue for May 8, p. 154) attention was directed to the weevils which attack stored peas and beans, and one of these, the cowpea weevil, was figured. Since the appearance of that article stored pigeon peas have been reported from St. Vincent as being attacked by an insect, which on examination proves to be the species mentioned above, *Bruchus chinensis*; and a small supply of pigeon peas for planting, sent to the Imperial Commissioner from Antigua, proved to be badly infested with the four-spotted bean weevil (*Bruchus quadrimaculatus*).

It is to be expected that the several species of bean and pea weevils which occur in the West Indies will be found to attack beans and peas generally. At the present time *B. chinensis* is known to attack pigeon peas and cowpeas, and *B. quadrimaculatus* to attack pigeon peas.

FIG. 9. THE COWPEA WEEVIL. Enlarged. (*From U. S. Dept. of Agriculture*)

The use of naphthalene instead of carbon bisulphide as a protection for stored seed against the attacks of these insects is indicated in the *Agricultural News* in the article referred to above, and it would seem that this substance should prove a most useful insecticide for such insects as the cowpea weevil and the four-spotted bean weevil. These insects are alike in their habit of infesting the growing grain in the field, and developing successive broods in the stored seeds.

This development can probably be checked at once by the use of naphthalene, but the point needs to be proved by careful experimental trials.

On reference to the article in the *Agricultural News* already referred to, it will be seen that when used at the rate of 1 lb. to 40 bushels of grain, naphthalene afforded a very satisfactory protection for stored corn. In this instance the naphthalene was used in cloth bags, each containing $\frac{1}{4}$-lb.

It seems probable that, used at several times that strength, say, 1 lb. or more for each bushel of grain confined in tight receptacles for a few days, the insects in peas and beans would be killed, and the injury which occurs after the grain is stored thus be entirely prevented.

Naphthalene is also recommended by its cheapness and its safety. It could be used over and over again, and it is not explosive like carbon bisulphide.

FIG. 10. THE FOUR-SPOTTED BEAN WEEVIL. *a*. adult; *b* larva; *c*. pupa. All enlarged (*From U. S. Department of Agriculture.*)

The economy in the use of naphthalene as an insecticide in stored grain results from the method of applying it. This consists in enclosing the desired amount of naphthalene in a bag of suitable size. The bag might be made of muslin, in the small sizes, and of ordinary burlap or sacking in the larger sizes. When used as a preventive in stored grain at the rate of 1 lb. to 40 bushels grain as mentioned above, the naphthalene was employed in $\frac{1}{4}$-lb. lots; but if it were desired to kill insects already in the grain, the larger dose of 1 lb. to 1 bushel, with the naphthalene in 1 lb. lots, should be tried. Experiments would soon show how effective this treatment would be, and also the length of time necessary to accomplish the desired object. At the end of this period the large bags of naphthalene could be taken out and the necessary protection afforded by the smaller doses. In this way very little of the insecticide is used at each application.

It must be borne in mind that in all fumigaton operations it is necessary to use tight receptacles, and in storing beans and peas as well as corn, infection and re-infection will occur unless suitable storage containers are used.

In connexion with the attacks of these two species it would seem that naphthalene would prove to be a most useful insecticide.

Another insect pest has been recently reported as attacking beans. This report comes from St. Vincent, where imported seed of pole Lima beans had been planted for trial in the plots at the Experiment Station. Specimens forwarded to the Imperial Department of Agriculture prove on examination to be a Cryptorhynchus similar to that recently reported as attacking cassava (*Agricultural News* for May 8).

The following is quoted from the memorandum of the Assistant Agricultural Superintendent, St. Vincent, in regard to the larvae of a Cryptorhynchus beetle attacking the stems of beans at the Experiment Station:—

'A small beetle grub tunnels the stem, beginning probably in the root, and causes the plant to break near the ground, and the leaves to turn yellow and fall off.

'The adult beetle was discovered on the stems of several plants, and on the ground near the base of the stem. In appearance the beetle resembles the cassava stem borer, but is slightly smaller. A stem which has been attacked can often be recognized by small brownish punctures in the stem, and by the enlarged nodes in which the grub is usually found.'

The genus Cryptorhynchus is a large one, containing some twenty-seven species in the West Indies, according to a recent catalogue.* Of these, several are known to occur in the Lesser Antilles, and the records now indicate the food plants of five of them. One attacks sweet potato, another is a borer in the orange tree, another is a borer in the woody stems and branches of ornamental crotons, another attacks cassava stems, and the last reported attacks beans.

This recently discovered species has not been investigated, and consequently nothing is known as to its habits. A careful watch should be kept by everyone interested in bean cultivation for the appearance of this pest, and every effort should be made to learn as much as possible about its life-history, habits, and food plants other than cultivated beans.

H.A.B.

* Preliminary list of the Coleoptera of the West Indies as recorded to January 1, 1914, by Chas. W. Leng, Hon. Curator of Coleoptera, and Andrew J. Mutchler, Assistant. Published as a Bulletin of the American Museum of Natural History.

LIVE-STOCK NOTES.

TICK ERADICATION IN ANTIGUA.

Spraying for the control of ticks in Antigua formed the subject of a paper in Vol. XIV, No. 2, of the *West Indian Bulletin*, in which it was shown that the results obtained from the use of one of Messrs. Cooper & Nephews' spraying machines were exceedingly satisfactory. The paper referred to contains a full account of the appliance, and gives figures to show the expenditure involved. Since the establishment of this appliance, the value of spraying has been very widely appreciated in all parts of the island, and although no further investments have been made in large sprayers like the one in question, many stock-owners have adopted systematic hand spraying, with the result that the general appearance of Antigua live-stock shows a very marked improvement compared with that to be observed two years ago.

In the United States and South Africa, in Argentina, Australia and other great cattle-raising countries, the use of permanent swim dips has been very generally adopted, often as the result of compulsion by the Government authorities. In considering the relative values of spraying and dipping, Messrs. Cooper & Nephews are of the opinion that the dip is more efficient, because it ensures every part of the animal, as for instance the folds of the skin, coming into contact with the arsenical liquid. On the other hand, the spray can be equally efficient provided the operation is conducted with thoroughness.

It should be pointed out that spraying is not limited to large herds and large machines. Hand spraying, if only a small number of animals have to be dealt with, can be very effective, since it is possible to give each animal individual attention. Even failing a specially made sprayer, it is quite possible to employ effectively an ordinary garden syringe. Hence the small owner can treat his animals as well as the large owner.

The comparative value of spraying *versus* dipping, on a large scale, is soon to be demonstrated in Antigua, where Messrs. Cooper & Nephews have offered a bonus equal to half the cost of erecting a swim dip in order to enable planters to test the appliance at a moderate cost. It is understood further that a second offer of a bonus of one-quarter the cost of a second dip has also been accepted. It is a matter for some regret, however, that both the estates on which these dips are to be erected are situated in the same district of the island. However, the enterprise shown by both the planters and Messrs. Cooper & Nephews is to be highly commended, and there can be no doubt that the forthcoming demonstration will be productive of much good, not only as regards live-stock improvement locally, but also as a stimulus towards similar action in other places.

TROPICAL FOODSTUFFS AND THEIR VALUATION.

A useful attempt has been made in Mauritius by the Director of Agriculture to collect together figures and other information concerning the nutritive value of local foodstuffs for stock, and the result is a memorandum presented to the Board of Agriculture of that Colony. The foodstuffs available for cattle at Mauritius may be classified as follows: (1) green fodders, e.g. cane, cane leaves and maize; (2) tubers, e.g. manioc, sweet potatoes; (3) seeds, e.g. dhall, sword beans, oats, rice and maize; (4) brans and meals, e.g. wheat bran, rice bran, ground nut meal, cotton-seed meal; (5) sugar waste, e.g. molascuit and molasses. The paper continues with an explanation concerning the relative values of the different proximate constituents of foods, like protein and carbohydrate, and a table is then given showing the crude composition of Mauritius foodstuffs. The question of digestibility of food constituents is then taken into account, and the digestible constituents of Mauritius foodstuffs are determined by calculation by means of factors, which are the mean of European and American authors. These factors are likely to be useful to West Indian planters, since in many cases only the ordinary composition of foodstuffs is known and not the digestible constituents. The factors in question are:—

	Seeds.	Meal.
Cellulose and non-nitrogenous substances	·7	·67
Fats or oils	·9	·62
Crude proteins	·9	·7

This means that for every gram of cellulose or non-nitrogenous substances shown by analysis in seeds, 0·7 is digestible, while in meals and brans ·67 gram only is digestible.

The last point dealt with is the important one of rations. The daily rations prescribed for stud animals by the Board of Agriculture are as follows:—

I.		II.		III.	
Manioc	10 lb.	Manioc	4 lb.	Manioc	8 lb.
Bran	3 ,,	Maize	4 ,,	Bran	3 ,,
Dhall	4 ,,	Dhall	4 ,,	Acacia	4 ,,
Molascuit	1 ,,	Bran	3 ,,	Molascuit	2 ,,

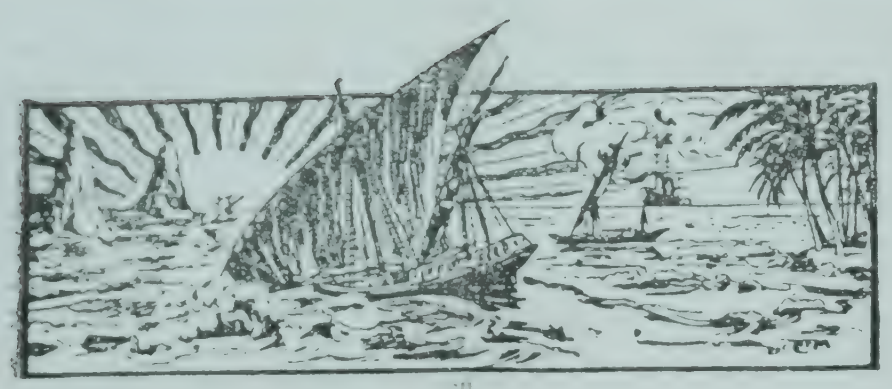
The food values of these rations are calculated as follows:—

	Starch.	Digestible protein.		Starch.	Digestible protein.
10 lb. manioc	2·3	·05	4 lb. manioc	·9	·02
3 ,, bran	2·1	·3	4 ,, maize	3·0	·35
4 ,, dhall	3·4	·7	4 ,, dhall	3·4	·7
1 ,, molascuit	·5	·01	4 ,, bran	2·1	·3
	8·3	1·06		9·4	1·37

		Starch.	Digestible protein.
Manioc	8 lb.	1·8	·04
Bran	3 ,,	2·1	·3
Acacia	4 ,,	4·3	1·0
Molascuit	2 ,,	1·0	·02
		9·2	1·36

These rations would be suited to draught animals at medium work provided they received 30 to 40 lb. of herbage; but if the animals were at very hard work it would be necessary to increase the protein content of the diet by additions of concentrated seeds such as Acacia, pois sabre, pois mascate, etc., or by additions of pistache (ground nut) meal or decorticated cotton-seed meal.

The above calculations will serve to illustrate how any estate manager may calculate out the food values of his rations.



GLEANINGS.

An Ordinance has been passed in Dominica to provide for the administration and disposal of Crown lands. A provision is made to the effect that if the grantee or lessee of any Crown lands neglect to comply with the conditions agreed to, the land shall revert to the Crown.

By an Order-in-Council, the names of certain birds in the Virgin Islands have been removed, according to the *Leeward Islands Gazette*, from the protected list in the Wild Birds Protection Ordinance, 1914. The birds referred to are: the pelican, the man-of-war bird, and the booby.

An interesting account of Nigerian leather appears in the *Journal of the Royal Society of Arts* for April 23, 1915. The method of treatment of leather in West Africa can be divided into four operations: depilation, bating, tanning, and dyeing. These operations are described in the article referred to, and the dyes employed are mentioned.

In connexion with the article which appears on another page of this issue on the subject of tick eradication, it is interesting to note that the Jamaica *Gleaner* for May 21, 1915, refers to an experimental dipping vat which is now in course of erection at the Hope Farm School. The results following the use of this appliance will be watched with interest.

A formula for the measurement of logs is given in the *Agricultural Gazette of New South Wales* for April 1, 1915. The superficial contents of any mill log may be determined as follows: take the mean girth of a log in inches, divide by four, and square it; multiply this result by the length of the log in feet, and the result will be the contents of the log in superficial feet.

A statement appears in *Nature* for May 20, 1915, to the effect that the President of the Board of Education in England has announced the proposed formation of an Advisory Council to be concerned with industrial and scientific research. The suggested Council will deal with the general question of the relation of science to the State, and its formation should result in increased application of science to industry.

An important matter concerning coffee cultivation in Southern India appears to be the pollination of the flowers by bees (*Apis dorsata*). In certain districts, considerable numbers have been destroyed by the native tribes, and it has been suggested that estate managers should communicate the boundaries of the adjoining government lands which require protection, which would assist the forest department to put a stop to all interference with this species of bees. (The *Planters' Chronicle*, February 1915.)

An appreciative notice appears in the *Kew Bulletin*, No. 3 of 1915, concerning the work of Mr. George Massee who has just retired from the post of Mycologist to the Royal Gardens, Kew. Ever since the formation of the Imperial Department of Agriculture, Mr. Massee has frequently rendered assistance in connexion with the determination of fungi causing diseases of plants in the West Indies.

In his address to the Legislative Council of St. Vincent, during March 1915, His Honour the Administrator referred at some length to the importance of maize cultivation as a new industry for the Colony. The fact that a small corn-drying plant to be installed by August next was mentioned. The scheme was warmly supported by several members of the Council. His Honour's address will be found in the St. Vincent *Government Gazette* for April 29, 1915.

An interesting article appears in the *Botanical Journal* for April 1915, dealing with ramie thread. The plant from which this is obtained belongs to the same natural order as hemp, and there are two species, one of which is purely tropical, while the other grows in semi-tropical or even temperate regions. It is said that ramie is cultivatied in most parts of the tropics, including the West Indies. The most important use of ramie is in the manufacture of gas mantles, but for this purpose fibre from the semi-tropical species is principally employed.

A new Canadian sugar refinery is described and illustrated in the *Louisiana Planter* for April 10, 1915. This large establishment has been erected by the Atlantic Sugar Refinery, Ltd, at St. Johns, New Brunswick. Directly in front of the building is a wharf where steamers can come alongside to be loaded straight from the refinery, and throughout the establishment every effort has been made to secure the highest efficiency in sugar refining at the lowest possible cost, utilizing the very best machineries that can be had for all of these various purposes.

An instructive table in *The Journal of the Board of Trade*, April 29, 1915, shows the difference between the exportation of rubber from Brazil during February 1914 and February 1915. For that month last year Brazil sent to the United States 1,848,136, and to Europe 3,359,322, making a total of 5,207,458 kilogs. During February 1915, Brazil sent to the United States 3,531,905, and to Europe 2,837,289, making a total of 6,369,194 kilogs. (1 kilog. = 2·2 lb.). These figures seem to show that the embargo placed by Great Britain upon Eastern rubber necessitated bigger purchases from South America by the United States.

An attempt made to utilize coco-nut oil for rifle lubrication in England has not proved altogether satisfactory. A comparison between the oil referred to and the ordinary service rifle oil showed in favour of coco-nut oil after seven days' keeping, but a large amount of fouling appeared on the barrels treated with coco-nut oil after keeping one month. Coco-nut oil is therefore considered inferior to service rifle oil for the purpose of preserving gun barrels. The samples used were Trinidad and Ceylon oils, respectively. They yielded almost identical constants. The Trinidad oil contained rather more free acids (4·9 per cent. against 3·4 per cent.) but the oils were considered of equal value with regard to their gun barrel preserving properties. (The *Monthly Magazine of the Incorporated Chamber of Commerce of Liverpool*, April 1915.)

STUDENTS' CORNER.

AGRICULTURAL EXAMINATIONS.

Now that the cane crop is practically over, students will be able to devote a greater proportion of their time to systematic study for the forthcoming examinations, to be conducted by the Imperial Department of Agriculture in November. If not already done, copies should be obtained of the revised syllabus of the Reading Courses issued a few months ago from this Office. This contains an up-to-date list of references including a useful collection of references to matter in the *Agricultural News* for the benefit of final students. Perusal of the leaflet referred to will show that coco-nuts have been introduced as a crop subject, and in view of the rapid extension of the area under coco-nuts in many of the islands, it is hoped that some of the candidates will select this crop as a subject for examination. As regards text-books, the student will remember that a useful though small library is to be found at most of the Botanic Stations, and it should not be forgotten that many of the public libraries contain works on agricultural science, which may be borrowed in the usual way. In Grenada, a good move is being made to establish a borrowing library for the agricultural cadets at the Botanic Gardens.

The success of the Reading Courses examinations does not depend entirely upon the enthusiasm of the candidates. It is essential that initiative should be shown by the agricultural officers, and also, it may be added, by the planters, on whom the students are in many cases dependent. The function of the agricultural officers in connexion with these examinations is to arrange meetings and, if possible, to give lectures. In Antigua special facilities exist for this teaching work, but it may be suggested, now that chemical assistants as well as science masters exist in Dominica and St. Kitts, that it may be found possible to increase the amount of assistance given in connexion with these examinations. The object of any lectures that may be given should not be to present information so much as to stimulate and guide. At such meetings candidates can discuss the difficulties encountered in their work not only with the lecturer but amongst themselves. This makes the study more interesting and live, and it affords a means of guaging individual progress.

A final consideration concerning these examinations is that which has relation to their utilitarian value. Several cases have occurred where the holding of the diploma of this Department has led to personal advancement, and for this reason alone, overseers and others should make every effort to become registered, and to study along the prescribed lines with a view to obtaining a qualification which will stand them in good stead in after-life.

Questions for Candidates.

PRELIMINARY QUESTIONS.

1. Name at least three active agents which aid in the formation of soils.

2. Give the reasons for growing leguminous crops other than for food.

INTERMEDIATE QUESTIONS.

1. Give one or two points to be noted in selecting coconuts for seed. At about what stage should the seedlings be removed from the nursery?

2. What are the most common errors in the cultivation of cacao?

FINAL QUESTIONS.

1. Explain fully the reasons why the cultivation of Indian corn and beans is being urged in many parts of the West Indies.

2. Name certain operations on the estate which are helpful in controlling pests and diseases. Explain why.

Training of Agricultural Pupils in Dominica.—A notice appears in the Dominica *Official Gazette* for June 14, 1915, to the effect that this month (July) there will be three vacancies for pupils under the present system of agricultural instruction.

The course of training extends over a period of two years, and pupils are required to engage in the various branches of field and nursery work with a view of acquiring a sound knowledge of practical agriculture.

The course of instruction will be directed toward the acquirement of a practical knowledge of the methods of plant propagation, nursery work, planting and care of staple crops such as limes, oranges, cacao, rubber, vanilla and fruit. The course will include instruction and practical work in the various forms of drainage, weeding, sowing, transplanting, use and application of manures and mulches; the treatment of insect and fungoid pests, pruning, grafting, packing, transporting and planting out young plants; picking, preparing, and packing crops for market.

In addition to the practical instruction and carrying out of the above outlined work at the Botanic and Experiment Stations, the pupils will receive an appropriate amount of class instruction in the fundamental principles underlying the practical work. They will also be required to undertake a prescribed amount of home reading and study under the direction of the Agricultural Superintendent.

Candidates must be at least sixteen years of age, physically fit, and have shown aptitude for instruction in agriculture. They must have attained a standard of elementary education corresponding to the sixth standard of the primary schools, or sufficient to satisfy the Agricultural Superintendent that they are capable of taking full advantage of the course of training offered.

Subject to good behaviour and satisfactory progress in their work, the pupils will be granted a small monetary allowance, increasing each year until the conclusion of their course of study.

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc., Entomologist on the staff of the Imperial Department of Agriculture, and Mr. W. Nowell, D.I.C., Mycologist, left Barbados by the R. M. S. 'Quillota' for the purpose of paying an official visit to Montserrat in connexion with the pests and diseases of cultivated plants in that island. The above officers are expected to return by the C. R. M. S. 'Caraquet' on July 14.

May proved a wet month in the Virgin Islands, and revived new hopes in the agricultural community in regard to next year's prospects. The greatest fall for one day was 2 inches. The total precipitation for the month was 8·37 inches, which was well distributed. The weather was very favourable for the establishment of the young cotton crop.

FUNGUS NOTES.

THE INTERNAL DISEASE OF COTTON BOLLS.

The investigation of this trouble having reached a stage where it seems likely that the course of future research will follow entomological as well as mycological lines, it seems advisable to summarize the history, and state the present position with regard to it.

The essential character of the affection consists in the discoloration, partial or total, of the lint in unopened bolls, without any sign of disease or injury occurring on the exterior of the boll.

Recognition of this condition as a distinct affection appears to have been confined to Montserrat and Antigua, and almost entirely to the former of these islands, until recent enquiries led to its recognition in St. Vincent and Tortola. In the first named island the earlier accounts, while evidently including this affection, do not always avoid confusion with shedding, with that type of failure of bolls now attributed to *Bacterium malvacearum* and known as bacterial boll disease, and with the Montserrat soft rot due to a Peronosporaceous fungus. This seems to have led to the adoption of the misleading name 'black boll' under which the affection has been until recently described, which has doubtless tended to prevent the identification of the same trouble in the other islands with that occurring in Montserrat.

The first reference to 'black boll' in the mycological files of the Imperial Department of Agriculture goes back to December 1903, when specimens of bolls which rotted before opening were sent for examination by Mr. C. Watson, of Montserrat. In January 1904, Mr. Watson reported that the disease had spread, and that the whole of the cotton on the Windward side of the island, some 400 acres, was affected. In going through the fields and picking fine-looking bolls from the most promising trees, only about 10 per cent. were found to be sound.

The specimens were examined by Mr. L. Lewton-Brain, then Mycologist to the Department, who reported the presence of Cercospora blotching and a small amount of anthracnose, but did not suggest these as the cause of the trouble. He recommended experiments with Bordeaux mixture.

In December 1904, two reports as to the disease in Montserrat were made by Mr. A. J. Jordan, and one by Mr. W. H. Patterson, Curators of the Botanic Stations at Montserrat and Antigua, respectively. Jordan's first report contains no information on the subject; Patterson's associates a mis-shaping and hardening of the pods with the disease, gives evidence of its rapid development, and shows that rotation of crops and manuring have apparently no effect upon its incidence. Jordan's second report, made in connexion with Patterson's visit, describes the affected bolls as 'oval-cuspidate' in all but one instance, but records the finding of healthy bolls also of this shape. The sprouting of the seeds in some of the rotted bolls is mentioned. In January 1905 Patterson reported the occurrence of what he regarded as the same disease in Antigua.

In February 1905, Lewton-Brain made an investigation of the affection in Antigua and Montserrat. His report was printed in the *West Indian Bulletin*, Vol. VI, pp. 120-23. He records the existence of a distinct disease of the bolls, differing entirely from anthracnose and 'physiological drying up', though sometimes confused with these. After alluding to the deformation of the bolls and their hardness (characters which are not evident in the material more recently examined,) he describes the occurrence of discoloured rotting lint in bolls of healthy external appearence, ending in a condition in which the enlarged partially germinated seeds are separated only by a thin film of decayed lint. Such bolls usually drop about the time they should be opening, and fields were seen which had lost every boll in this way. Sometimes the bolls dry up on the plant and open slightly, when they are distinguishable by the appearance of the lint. The disease could not be ascribed to climatic conditions, since it had occurred in very dry and very wet seasons; nor could the condition of the soil be responsible, since it occurred on both limestone and clay, and on poor and rich land. He was unable to connect the disease with any insect attack, or with any of the known diseases of cotton. A plant might have one or two bolls affected while the remainder continued healthy, and plants which had lost every boll might afterwards bear sound bolls in the second crop. No corresponding affection of stems or leaves could be found. He reported the presence in affected bolls of a rod-shaped bacillus, which he regarded as the probable primary cause of the disease, suggesting the possibility of flower infection by the agency of wind or insects. He outlined a series of field experiments to ascertain the stage at which infection takes place, but there is no record of their having been carried out.

From the time of Lewton-Brain's report the subject does not appear to have been brought to the notice of the Imperial Department until 1911. The narrative of subsequent developments will be continued in the next issue of this journal.

W.N.

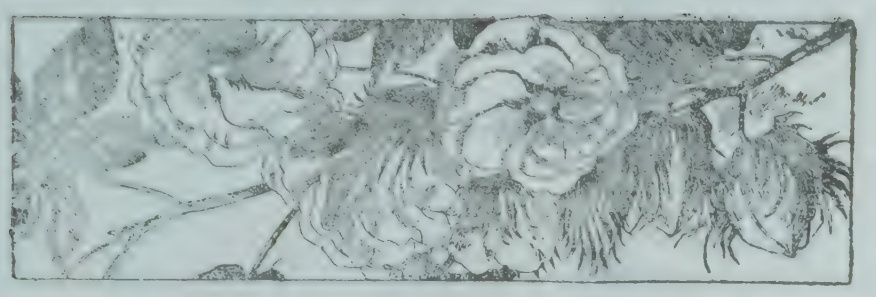
THE ITALIAN TOMATO TRADE.

The tomato was given to the world by America, but Italy is to-day teaching the rest of the world by example how it should be raised and how it should be preserved. Italian canned tomatoes have practically pushed the American product out of the English market, and have gained an enormous market in the United States. The Italians raise a solid meaty tomato of fine colour, and it is so packed in the cans that the consumer is not obliged to pay for a large percentage of water.

Canned tomatoes, however, are put up principally for the export trade. The Italians themselves prefer their tomatoes in the form of sauce or paste, which is nothing more nor less than boiled-down tomato pulp, minus the skins and seeds, as set forth in an interesting manner in a report by Commercial Agent J. Alexis Shriver, entitled 'Canned-Tomato Industry in Italy', recently issued by the Bureau of Foreign and Domestic Commerce. This sauce is put up in cans and is used by the Italians in a great variety of dishes, of which spaghetti is, perhaps, the most familiar to Americans.

According to fairly accurate statistics the area planted in tomatoes in Italy is about 22,000 acres, producing about 385,000 tons. The exports to the United States amount to about 20,000,000lb. of canned tomatoes and tomato sauce, and some 8,000,000lb. of the product go to South America. The total value of the total exports from Italy is well over $6,000,000.

The skins and seeds that were formerly wasted are now utilized, the former as stock feed and the latter as a source of oil. The crude oil is suitable for soap making and for lamps, and the refined oil is said to be edible. Commercial Agent Shriver's report 'Special Agents Series No. 93', may be obtained from the Superintendent of Documents, Government Printing Office, Washington, at 5c. a copy. (*The Hawaiian Forester and Agriculturist*, March 1915.)



DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. The Agricultural Superintendent (Mr. J. C. Moore) states that arrangements have been completed to carry out the experimental and demonstrational cultivation of provisions this year on an acre plot of land at Dumfries, Carriacou, with the kind co-operation of the manager, Mr. C. P. Thomas.

Work in the Botanic Gardens has included the distribution of a considerable number of limes and coco-nuts, and trials are being made with sisal, and Lima beans.

As regards the general appearance of the estate crops, the cacao fields during May showed splendid vigour, and in many parts of the island were putting out flowers plentifully. During the month, forty-one settlers were given permission to occupy allotments at the St. Cyr mountain estate under the Grenada Land Settlement Scheme.

A special committee of the primary Education Board has been appointed to consider agricultural education in the primary schools.

The first two weeks of May were comparatively moist but the latter half was rather dry. The last day of the month showed signs of the weather breaking into the rainy season.

ST. VINCENT. The Agricultural Superintendent in this Colony (Mr. W. N. Sands), in referring to the experimental work at the Botanic Station, states that plots of Indian corn have been sown at different distances, and different varieties of Lima and other beans are under trial. On the estates, extensions in the planting of coco-nuts, Indian corn, beans and peas are to be noted. Cotton planting has been started.

During May the Assistant Agricultural Superintendent restarted agricultural science classes at the Grammar School, and examined several boys to fill vacancies for the agricultural pupils.

The rainfall for the month was seasonable.

DOMINICA. Mr. Joseph Jones (Agricultural Superintendent) reports that a large amount of routine work has been done in the nurseries, while in the lime experiment station the principal operations have been weeding, draining, sowing green dressings among the young limes, and the picking and recording of the crop from older trees. In the cacao experiment station the annual application of manures has been completed. The picking and recording of the crop was being carried on at the time of writing.

As regards the condition of the lime crop, there are indications of a fair average yield, probably heavier on the Leeward coast districts than elsewhere. The cable quotation for concentrated juice was £25 per pipe. Local price for yellow limes was 10*s.* per barrel, and for good raw juice 1*s.* 4*d.* per gallon. Heavy shipments of green limes amounting to 5,600 barrels were made during the month.

Matters of general interest during the period under review were the official visits of the Imperial Commissioner of Agriculture and the Mycologist.

The rainfall for the month was normal.

MONTSERRAT. The Curator of the Botanic Station (Mr. W. Robson) forwards several items of agricultural interest from this island. Much satisfaction has followed the successful shipment of crates of onions to Canada. These were reported to be equal if not superior to the Bermuda stock. This will help to give encouragement to those who are anxious to see an association in Montserrat similar to the one formed in Antigua two years ago.

Most of the cotton area has been planted, and there have been no complaints about germination or disease. Planters, however, are finding difficulty in getting the last cotton crop shipped. The rainfall for the month is reported as having been quite heavy enough for the cotton crop at its stage at that time.

ANTIGUA. During May, the variety sugar-cane crops at Cassada Garden, Diamond, and Friars Hill were reaped, as well as the corn and other plots at Skerretts. The young cane crops continued to improve.

There were several meetings held during the month of agricultural interest, namely meetings at the Government Board, Permanent Exhibition Committee, Committee of the Agricultural Society, and general meeting of the Agricultural Society. One lecture was given to students by the Superintendent of Agriculture and one by the Curator.

During the month of May the rainfall was 1·18 inches.

ST. KITTS. According to the Agricultural Superintendent (Mr. F R. Shepherd) a considerable part of the work in the Experiment Station consisted in the production of beans, corn, and other provision crops.

On the estates the reaping of the old cane crop has been pushed on with the favourable weather, but the quality of the juice had very much gone off owing to the heavy rains. In consequence, the yield of sugar per acre on the muscovado estates has not been so great as was expected. The young cane crop was growing rapidly, but in some districts fields were to be seen which were not so advanced as they should have been, and the growth was very uneven owing to the large numbers of supplies.

A fairly large area of cotton has been planted and the germination of the seed has been excellent. The total area of cotton planted for the coming season will be reduced to about one-third owing to greater attention being paid to cane. About 4,000 lb. of selected cotton seed was procured and shipped to the Agricultural Superintendent, St. Vincent, for planting.

During the month, the Commissioner of Agriculture visited the island for a few days and delivered an address before the Agricultural Society. This has already been noticed in this journal.

Work conducted at the Government Laboratory by the Assistant Chemist has consisted in the comparative estimation of fibre in sisal leaf for the purpose of comparing methods of extraction, and the analysis of several samples of milk received from the Inspector of Police. Work connected with the sugar-cane experiments has also been in progress.

NEVIS. During May, the young canes throughout the island were very promising. Mr. W. Howell (the Agricultural Instructor) states that it is satisfactory to note that pen manure is being more generally used. The young cotton was, on the whole, doing well. As regards provision crops, a fair acreage of sweet potatoes and yams was planted during the month. With reference to coco-nuts, it is stated that the nuts in the nursery at Jones estate have started to germinate and that the lands are being cleared for planting.

During the visit of the Commissioner of Agriculture, a meeting of planters was held at the Court House where Dr. Watts gave an address with reference to the present agricultural outlook of the island.

MARKET REPORTS.

London.—The West India Committee Circular, June 1, 1915.

Arrowroot—$2\frac{3}{4}d.$ to $4\frac{1}{4}d.$
Balata—Sheet, 2/4½; block, 1/11½ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 82/- per cwt.; Grenada, 73/- to 79/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £23 15*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, $14\frac{1}{2}d.$ to $17d.$
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 55/- to 70/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/- to 3/3; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations
Mace—$9d.$ to $2/11d.$
Nutmegs—$4\frac{1}{4}d.$ to $5\frac{3}{4}d.$
Pimento—$1\frac{7}{8}d.$ to $2\frac{1}{16}d.$
Rubber—Para, fine hard, 2/7¼; fine soft, 2/2¼; Castilloa, 2/-.
Rum—Jamaica, 3/- to 3/8.

New York.—Messrs. Gillespie Bros., & Co., June 9 1915.

Cacao—Caracas, 13¼c. to 15c.; Grenada, 13¾c. to 14c.; Trinidad, 13¼c. to 14¼c.; Jamaica, 10¾c. to 11½c.
Coco-nuts—Jamaica, selects, $25·00 to $26·00; Trinidad, $26·00 to $27·00; culls, $16·00 to $17·00.
Coffee—Jamaica, 7¾c. to 11c. per lb.
Ginger—12c. to 15c. per lb.
Goat Skins—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 39c. to 42c. per lb.
Grape Fruit—Jamaica, $2·25 to $3·50.
Limes.—$7·00 to $8·00.
Mace—48c. to 52c. per lb.
Nutmegs—10¾c. to 11c.
Oranges—Jamaica, $2·50 to $3·25.
Pimento—3¾c. per lb.
Sugar—Centrifugals, 96°, 4·89c.; Muscovados, 89°, 4·24c.; Molasses, 89 , 4·12c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., June 28, 1915.

Cacao—Venezuelan, $15·00; Trinidad, no quotation.
Coco-nut Oil—80c. per Imperial gallon.
Coffee—Venezuelan, no quotation
Copra—$3·60 to $3·80 per 100 lb.
Dhal—No quotations.
Onions—$2·60 to $3·25 per 100 lb.
Peas, Split—$12·00 per bag.
Potatoes—English $1·75 to $2·00 per 100 lb.
Rice—Yellow, $6·00 to $6·25; White, $5·75 to $5·90 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. T. S. Garraway & Co., June 30, 1915.

Arrowroot—$4·00 to $4·50 per 100 lb.
Cacao—$16·00 per 100 lb.
Coco-nuts—$16·00.
Hay—$1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $82·00 per ton.
Molasses—No quotations.
Onions—$2·75 per 190 lb.
Peas, Split—No quotations; Canada, $5·40.
Potatoes—Nova Scotia, $4·00 per 160 lb.
Rice—Ballam, $6·00 to $6·40 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, no quotations.

British Guiana.—Messrs. Wieting & Richter, June 26, 1915; Messrs. Sandbach, Parker & Co., June 25, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	—	$10·00
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	14c. to 15c. per lb.	16c. per lb.
Cassava—	96c. to $1·20	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	——	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14½c to 15c.
Liberian	10c. per lb.	10c. per lb.
Dhal—	——	——
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	6c. to 7c. per lb.
Madeira	——	——
Peas—Split	$12·00 to $12·50	$13·00 to $14·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$4·00	$5·00
Lisbon	——	——
Potatoes--Sweet, B'bados	$2·00	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
Tannias—	——	——
Yams—White	——	——
Buck	$2·64	——
Sugar—Dark crystals	$3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Ankylostomiasis.

HOOK-WORM disease, or Ankylostomiasis, can certainly be regarded as one of the most insidious and deteriorating maladies affecting West Indian labour. Its prevalence is intimately connected with the habits of the people, and for this reason its eradication is a matter of considerable difficulty. In many places, notably in Demerara and in Panama, intensive campaigns have been conducted against the disease, and with success; but in some of the smaller islands of the West Indies and in parts of tropical America, practically nothing has been done to stamp out or even to lessen the evil.

Ankylostomiasis is a disease produced by a small round worm which is parasitic in the intestines of man. The eggs of the parasite pass out in the excrements, and as it is not habitual for the labourer to make use of sanitary conveniences, the soil becomes infected. Here the eggs, in the presence of moisture, develop into larvae, some of which eventually penetrate into the feet of other labourers and, finding their way to the intestines, change into adult forms again, attaching themselves by means of hook processes to the intestinal walls.

One of the principal symptoms is anæmia resulting from blood degeneration, but it is also characteristic for this disease to affect the nervous system. Affected subjects sink into a state of indifference and apathy approaching, in some cases, almost to insanity. Persons suffering from the malady are therefore not desirous of being treated, which is one of the reasons why compulsory measures are so necessary.

It can be readily understood, also, that this bad effect upon the intelligence and physique renders infected labour much inferior to that which is healthy. This applies both to estate conditions and to those where the labourer works his own land. Ridding a district of Ankylostomiasis would be the first and most important step towards improving the condition of the agricultural class and of increasing its efficiency.

The extent to which hook-worm disease is prevalent in the West Indies can be gauged by perusal of two recent reports (1) (2). At San Fernando in Trinidad, during March, 59·56 per cent. of the total persons examined were found to be infected. A marked

(1). Ankylostomiasis Operations (*Report of the International Health Commission*, March 1915) Trinidad and Tobago: Council Paper No. 45 of 1915.

(2). Report on Ankylostomiasis in Antigua, by E. S. Marshall, M.R.C.S., D.T.M., etc. Published by the Government of the Leeward Islands, 1915.

difference was noted in the relative susceptibility of the Creoles and East Indians: the percentage of infection in the case of the Creoles was 32·71, while that in the case of the East Indians was 85·78. It might seem probable at first that this difference was due to difference in habits, but since both races live under the same conditions in adjoining houses and follow similar occupations, it is evidently the result of racial immunity.

In comparing the San Fernando figures with those given by Dr. Marshall for Antigua, only the Creole figures can be taken in the case of the former as there is no East Indian population in Antigua. According to Dr. Marshall, in some districts, over 50 per cent. of the adult population and 10 to 27 per cent. of the children are infected. These percentages are high, and can be correlated with the lethargic and lazy characters of the inhabitants of these districts. In the Central Plain district of Antigua, the percentage of infection is lower, being only 19·1. It is pointed out, however, that the heavier rain fall and soil of this district render the disease more likely to thrive than in the calcareous areas where the soil and rainfall are lighter. This condition of extreme prevalence of the disease in the drier district more or less unfavourable for it naturally, seems to point forcibly to the chronic lassitude that must prevail amongst the inhabitants.

As regards the eradication of Ankylostomiasis, it is recommended that efforts should be made to examine and treat, where infected, every man, woman and child in the villages until they are pronounced free from infection. It is important that latrines of a suitable pattern should be erected in each village, and that the people should be compelled to make use of them. Water sources should be carefully protected from contamination. Finally, provision should be made to prevent the entry or re-entry of infected persons from abroad. Anyone failing to produce a certificate of health should be quarantined until certified to be free from ankylostome ova.

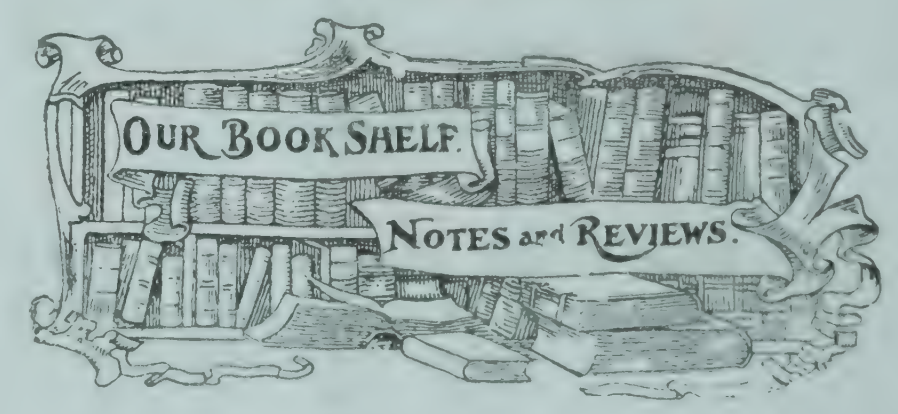
Interesting information has been given by Dr. W. Thomas (3) concerning Ankylostomiasis in North Brazil. In Manaos, in 1909, 88 per cent. of the population harboured the parasite, and yet no action was taken by the State to combat the disease. Dr. Thomas refers to the great value of the internal antiseptic thymol in treating the disease, and records the case where a veritable idiot was by this treatment transformed into a bright, active child: a change which impresses parents, and is a valuable aid in pursuading other patients to take treatment.

Even in Panama, on the Canal Zone, Ankylostomiasis is still very common, or was in 1912, when Dr. D. Thomson visited the zone on the Malaria Expedition of that year (4). Nevertheless the disease is combated by the establishment of a very thorough latrine system along the line of the Canal. The Sanitary Inspectors look after the latrines in their respective districts. The latrines are fly-proof, and their position is frequently changed. Patients coming into the hospitals and dispensaries are constantly examined for ankylostome ova, and they are given a thorough course of santonine treatment if these are found.

All that we have said in the preceding paragraphs puts emphasis on the fact that Ankylostomiasis is a widely prevalent degenerating disease seriously affecting tropical labour. It is therefore in the interest of the planter to co-operate in enforcing measures for its eradication. The ways in which this can be done have been outlined above. To the measures suggested may be added a vigorous educational campaign. More might be done in the elementary schools to make the children realize the importance of living in accordance with the principles of hygiene: more might be done on the estates to encourage the observance of such teaching in every-day life.

(3). The Sanitary Conditions and Diseases prevailing in Manaos, North Brazil, 1905-9. *Annals of Tropical Medicine and Parasitology*, Vol. IV, pp. 40-3.

(4). Sanitation on the Panama Canal Zone, Trinidad and British Guiana. *Annals of Tropical Medicine and Parasitology*, Vol. VII, p. 137.



PRACTICAL WHITE SUGAR MANUFACTURE. By H. C. Prinsen Geerligs, Ph.D. *Norman Rodger*, London, 1915. Price 12*s*. net.

Hitherto the conditions under which sugar manufactured in the British West Indies has been marketed, have largely precluded the consideration of the manufacture of sugar other than that intended for the refiner. A certain quantity of sugar of the well-known type of Demerara or Yellow crystals has been saleable in the London market, but the demand for

this has been limited, and the excess has had to be made to suit the refiner.

Comparatively little raw West Indian sugar for the refiner has of late years been sold in England until conditions were profoundly disturbed by the present war. In former years the greater part of this sugar went to the New York market, while in recent years it has largely been sold in Canada.

In these two markets the interests of the refiners have been protected by the imposition of a higher scale of duty on sugars which are light in colour and which might conceivably go into direct consumption without refining, the fixing of the higher rate of duty being carried out by reference to the Dutch Standard of colour.

Now that this charging of relatively higher duties on light-coloured sugars, judged by the Dutch Standard, has been abolished in the United States, and seeing that it is not in force in England, much attention has lately been given to the consideration whether it may not be possible in the tropics generally, and so in the West Indies, to manufacture light-coloured and particularly, white sugars, which may find profitable markets in the United Kingdom and the United States for the purpose of entering into direct consumption.

In view of this much has been written lately on the subject of the manufacture of white sugar in cane-sugar factories. The most recent addition to this literature is the work *Practical White Sugar Manufacture*, by Dr. H. G. Prinsen Geerligs.

Dr. Geerligs is so well known as an authority on the subject of the manufacture of cane sugar that anything written by him commands immediate and world-wide attention, and this will be the case with this, his latest work.

The book will prove a very useful guide to the numerous sugar planters in the West Indies, as well as elsewhere, who are asking themselves whether they should give consideration to the question of making white sugar. It can safely be recommended to them, and careful study will impress those interested readers with its value. That Dr. Prinsen Geerligs realizes their needs and tries to meet them may be shown by quoting from the book under review:—

'When asked to choose between the many different processes for the clarification of cane juice intended for manufacture of white sugar, we should be guided in our considerations by different observations. If we are sure to dispose of our whole product as white sugar, it is advisable to arrange the whole sugar-house for the manufacture of that special article and have the best machinery and equipment for that purpose. If, however, we make, say, half our crop in whites in one year without knowing whether in a subsequent season the market will be favourable for whites or perhaps be better for raw sugar, it is preferable to choose a system in which the main lines of manufacture run parallel, and only some relatively small alterations are sufficient to turn out either raw sugar or plantaton whites.'

The work itself gives detailed consideration to the various points involved in the production of white sugar. The first part deals with the general question of the clarification of cane juice, the first chapter explaining clearly and in language easily understood by the sugar maker who is not a technical chemist, the principles on which the work of clarification is based: these principles should be grasped by all sugar makers, whether concerned with making white sugar or not.

The succeeding chapters describe in detail the methods of clarification, including those dependent on carbonatation in its various modifications embracing single and double carbonatation, Haan's modification, Weinrich's process, and the recently proposed Battelle method, as well as of processes dependent on the use of phosphoric and sulphurous acids and special methods, such as those in which such decolourizing agents as animal charcoal and certain special decolourizing carbons such as 'Eponit', 'Norit' and 'Noir épuré' are used.

Consideration is also given to methods for the clarification of the syrup.

The statement of the general principles involved in the treatment of molasses before reboiling is very concise, but well deserving of being carefully read and apprehended by all sugar makers.

Several of the methods described are such as are likely to have consideration in West Indian sugar factories, and those who are thinking of employing them will be well advised to read what is here said concerning them, not the least important remarks being found in Chapters V and VI, which deal with the advantages and disadvantages of the different processes, and the costs and yields of the different clarification processes, respectively.

The second part of the work treats of the boiling, curing and finishing of white sugar.

In the first chapter of this part clear directions are given for the boiling and graining of white sugar in the vacuum pan; much stress is laid on the formation of and building upon a good grain, and of the maintenance of adequate circulation of the massecuite, for if this is not secured local over-heating may take place, resulting in dark-coloured products, nullifying all the efforts to produce white sugar. The use of stirring devices is advocated; in this connexion valuable directions are given for working mixed massecuites in which molasses is worked up.

Chapter II of this part is devoted to curing and finishing the sugar, and contains much valuable information on this critical part of the work of white sugar-making: the production of various grades of white sugar such as Granulated, Lump, Pilé or 'Broksuiker', and Cubes being described.

The second part concludes with a useful chapter giving schemes for the manufacture of white sugar of different descriptions, and the necessary capacity of the plant required.

The third part is devoted to the consideration of the materials employed in the manufacture of plantation white sugar, and is of considerable importance to the sugar manufacturer and chemist.

This review may fittingly end with a quotation from the introduction to the work in question.

'Instead of being rather an easy task, only requiring a little additional machinery over that used in a common raw sugar factory, the manufacture of Plantation White Sugar demands not only a good knowledge of general sugar manufacture but also special skill on the part of the manager, employees and workmen, and above all a large capacity in all departments of the sugar-house, and a proper arrangement of the whole plant.

'Our greatest enemies are inversion and colouration, and we have to suppress these two to the utmost of our power. Therefore no juice or syrup or masecuite should be allowed to stand any longer than can possibly be helped, and, in the second place, any probability of over-heating should be avoided in every way.

'No massing together of heterogeneous types of machinery should be allowed, but each item of the whole plant should be well calculated and be in relation to the rest, so that at no stage will the regular course of manufacture meet with an obstacle to prevent it from turning out the maximum yield of brilliantly white sugar from the cane juice in the shortest time possible.'

MINOR CROPS.

ONION GROWERS' ASSOCIATION FOR MONTSERRAT.

Principally as a result of two reciprocal visits, one by the Curator, Montserrat, to the Antigua Onion Growers' premises, the other by the Superintendent of Agriculture for the Leeward Islands to Montserrat where he gave an address on the subject of the co-operative sale of onions in Antigua, it has been practically decided by planters in Montserrat to establish an Onion Growers' Association in that island. A Committee has already been formed, and has drafted rules based upon experience in Antigua, and the same Committee has approached the Government with a view to obtaining assistance in regard to the provision of suitable premises for carrying on the business operations of the society. The Committee has also applied to the Government for assistance in raising capital required in the first year for making advanced payments to growers at the rate of 1c. per lb. of onions. As in Antigua, it is intended that subsequent profits shall be distributed *pro rata* among contributing growers, after deducting necessary working expenses and a small percentage as the profit of the Association. As in Antigua also, the Association, which is in process of formation, will be provided with an official brand or stamp, and the affixing of this brand or stamp to any package shall be deemed a guarantee that the contents have been properly cured, graded and packed.

It would seem that the present time is a good one for the establishment of the Association referred to, especially since the Montserrat orders for onion seeds this year have been exceptionally large. There is little doubt that if due advantage is taken of the experience in Antigua, and due consideration is given to local conditions in Montserrat, the proposed Association will serve a useful purpose and meet with gratfiying success.

OBSERVATIONS ON THE LIMA BEAN.

In the *West Indian Bulletin* (Vol. XV, No. 1) just issued by this Department, there appears a review of our present knowledge concerning the poisonous forms of the Lima bean (*Phaseolus lunatus*). There is no evidence to show that these forms occur to any large extent in the West Indies, and there are no recorded cases of poisoning. Briefly it would seem that while many of the numerous coloured strains may contain small quantities of the cyanogenetic glucoside, it is only the so-called purple Java or Mauritius beans that have produced fatalities. The white Lima, extensively cultivated in America and elsewhere, is harmless, and is a well recognized article of diet. This is the bean which is being increasing grown at present in some of the West Indian islands.

As far as one can tell, the white Lima as well as the Barbuda bean and the Sugar bean of the West Indies orginated from a coloured form, the improvement being effected by selection. The responsive character of these beans to selection is indicated by some specimens recently forwarded to this Office by Mr. Jackson, Curator of the Botanic Station, Antigua. The samples consisted of three sorts—small, ordinary, and large Barbudas. The following table shows that by selection the small has been so improved as to exceed in size the imported Lima as grown in California:—

	Average length in inches.
Small Barbuda	0·4
Ordinary	0·6
Large	1·0
Imported Lima	0·8

These figures are very striking, and indicate what might be expected if selection work were systematically carried on.

The Raising of Sugar-cane Varieties.—In reviewing the recent report on seedling canes in Barbados, the *West India Committee Circular* (June 15) reproduces the following account of the system employed: 'The majority of seedlings are raised from seed planted early in the year in boxes and afterwards potted. The better specimens (generally some thousands in number,) are planted in May in a field arranged for irrigation, so that during their more tender period they can be protected from drought, if necessary. They are kept under careful observation during their growth, and when they come to maturity in the March or May of the following year, those varieties whose agricultural qualities are good enough are reaped and analysed. The whole stool is cut, weighed and crushed, and if the chemical analysis shows that the juice is rich and pure, the stools are dug up, cut in half, and planted where they can be irrigated to induce a spring of ratoon canes to provide plants for multiplying the variety the following December. From that time the variety is annually propagated and multiplied in the usual manner, and if the results warrant, it is grown in an increasing number of plots in different districts both as plants and ratoons. Each year these plots are reaped and weighed, samples of the canes are crushed in a small estate mill at the Laboratory, and the juice is analysed, and this goes on until the cane is either ultimately rejected, or plants are supplied to the planters with the recommendation to try them on a small estate scale.'

It might be pointed out that the practice of raising local seedling canes has of recent years rapidly extended; for instance, in Porto Rico, the planters themselves raise annually some 2,000. While Barbados and Demerara are the pioneers, good work in the present connexion is being carried on throughout the tropics.

IMPROVEMENT OF INDIGO.

The present shortage of synthetic dyes has created an unusual demand for natural indigo. The Government of India, who are giving special attention to the improvement of indigo at the present time, no doubt appreciate this fact, and it is possible that it is one of the reasons for the work of indigo improvement described in the *Agricultural Journal of India* for April 1915.

The paper in question, by Albert Howard, C.I.E., M.A., Imperial Economic Botanist, and Gabrielle L. C. Howard, M.A., Personal Assistant, deals with the progress made in establishing the seed supply, in improving the yield of indigo, and also in finding a more valuable cover crop for the Java plant. The authors state that nothing has been attempted in the direction of studying the manufacturing process with a view to discovering the best way of producing pure indigo direct from the plant. This is not necessary for the local

trade, but it will have to be taken up if natural indigo is to make any progress in the European market. One of the great advantages of the synthetic product is that it is easily manipulated in the vats, whereas natural indigo varies greatly in composition and dyeing power, and therefore requires expert supervision. Under modern conditions of production this is a great disadvantage.

In considering the manufacture of indican from the standpoint of the planter, it is made clear that future progress will depend upon the capacity of the planting community to apply the principles underlying the successful growth of the crop.

In the course of several interesting pages on this part of the subject, Mr. and Mrs. Howard strongly emphasize the importance of encouraging the development of the root nodules of this plant. Apparently observations have shown that there is a direct correlation between nodule activity, i.e., the fixation of atmospheric nitrogen, and high indican content. Every planter knows, it is stated, that indigo grown on rather poor land gives the best yield of finished indigo, and often the best colour. When indigo is grown on rich land containing a high proportion of organic matter such as seeth (residue after extraction), the number of nodules formed on the root is small, and the bacteria in them do not work at any great pressure. In such soil, nitrates are formed in abundance, and the indigo plant then behaves like tobacco and takes up its nitrogen by way of the root hairs, in the form of nitrates dissolved in the soil water. Under such circumstances the growth is rapid, but little indican is accumulated, and if such plants be steeped, they give a small proportion of indigo and, moreover, of poor quality indigo.

The necessary conditions for the activity of the root nodules is an open soil, well aerated. Hence one of the principal features of soil cultivation when growing indigo is the use of the tine harrow, and similar implements for keeping the soil well stirred. The importance of the aeration of the soil is strongly emphasized.

The improvement of the yield of indigo with reference to cultivation also depends upon the stirring of the soil and the judicious use of cover crops. A word of warning is given in regard to the over-pruning of indigo at the first cut.

As stated in an earlier paragraph, one of the principal objects in the work under review has been to establish a seed supply of Java indigo. It may be mentioned here that the Java indigo is more generally cultivated than the Sumatrana indigo, which is a different and less desirable species. Mr. and Mrs. Howard have come to the decision that in future seed supplies, leaf growing, and seed growing should be regarded as separate things. It is impossible to carry on satisfactorily cultivations with both objects in view. A satisfactory method of producing seed has been arrived at at Pusa, the plants being sown much wider apart than when grown for leaf. It is mentioned incidentally that the flower of the Java indigo is a bee flower, and the visits of these insects are necessary to bring about pollination. Finally attention is called to the successful cultivation on high lands of wheat and indigo together. The well-known Pusa 4 has proved most satisfactory because this is a rapid grower, does not tiller much, has a very strong straw, and is provided with few leaves. If the cultivation of indigo comes to be taken up again by planters in the West Indies, the question of growing the crop in conjunction with another one will have to be one of the first things to be considered.

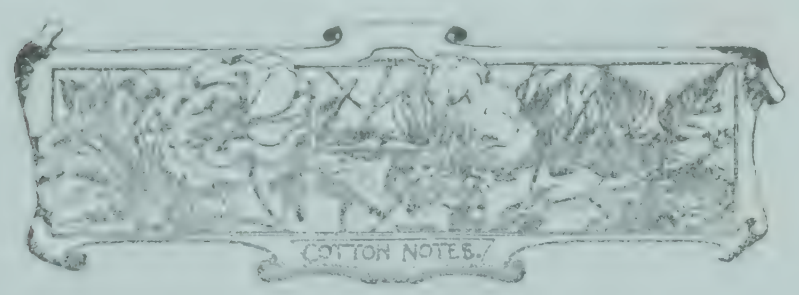
As regards the manufacture of indigo from the plant, the reader who may desire information on this part of the subject, is referred back to the *Agricultural News*, Vol. XIV, p. 15.

MAIZE SHOW IN ANTIGUA.

A notice appeared in a recent issue of the *Agricultural News* to the effect that a suggestion has been made to hold a small show of maize and maize products with the idea of endeavouring to stimulate interest in the growth of this crop in Antigua. More definite information has now been received, and it is understood that the exhibition will take place in November. It is proposed to make admission to the show by invitations broadly distributed throughout the community, and to combine with it an afternoon reception given by the members of the Agricultural Society; while at the same time special arrangements will be made for the staging of a Department of Agriculture exhibit combined with a popular address on some of the more important points connected with the industry.

The following is the suggested prize list, which has been forwarded to this Office by Dr. H. A. Tempany:—

(1) 24 ears of corn grown by an estate to be judged on points.	1st prize 7*s.* 6*d.* 2nd ,, 3*s.* 6*d.* and a diploma.
(2) 12 lb. of shelled corn grown by an estate to be accompanied by a certificate as to acreage, the plot to be open to inspection and report by the Agricultural Department.	1st prize 7*s.* 6*d.* 2nd ,, 3*s.* 6*d.* and a diploma.
(3) 4 lb. of corn and cob meal ground on an estate.	1st prize 4*s.* 2nd ,, 2*s.*
(4) 4 lb. of corn meal prepared from locally grown corn.	1st prize 4*s.* 2nd ,, 2*s.*
(5) 12 ears of corn grown by a cultivator of not more than 2 acres of land.	1st prize 6*s.* 2nd ,, 3*s.* and diploma if exhibits warrant it.
(6) 12 lb. of shelled corn grown by a cultivator of not more than 2 acres of land, to be accompanied by a certificate signed by a member of the Committee of the Agricultural and Commercial Society or Minister of Religion, Doctor, Member of Legislative Council, or Head of a Government Department as to yield per acre.	1st prize 4*s.* 2nd ,, 2*s.*
(7) 8 lb. of corn stover dried for fodder.	1st prize 4*s.* 2nd ,, 2*s.*
(8) Any other article made from any part of the corn plant.	1st prize 4*s.* 2nd ,, 2*s.*
(9) Champion prize for the best single ear of corn exhibited at the show in any class. The ear to become the property of the Agricultural Department.	1st prize 10*s.*
(10) Collection of dishes illustrating various methods of serving corn and corn meal as food.	1st prize 20*s.* 2nd ,, 10*s.* presented by the Chairman of the Agricultural and Commercial Society.



COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under dates June 16 and 28, 1915, respectively, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 160 bales of West Indian Sea Island cotton have been sold, including St. Vincent 16¾*d.* and St. Kitts 16*d.*; the sales also include about 30 bags of Stains at 6⅞*d.* Prices are steady.

Since our last report [June 16] there has been no business passing in West Indian Sea Island cotton.

COTTON EXPORTS FROM THE WEST INDIES.

The following table gives the quantity and estimated value of Sea Island cotton exported from the various West Indian Colonies for the quarter ended March 31, 1915:—

Colony.	Quantity. lb.	Estimated value. £
St. Kitts	202,984	11,841
Barbados	100,784	6,719
Montserrat	94,784	5,520
St. Vincent	82,089	5,473
Nevis	70,906	4,136
Antigua	41,000	2,074
Anguilla	14,750	860
Virgin Islands	12,311	616
Jamaica	5,031	209
Grenada	Nil	
Total	624,639	37,448

In addition to the above there was shipped from Grenada 14,448 lb. Marie Galante cotton valued at £442.

Unit Values of Food.—A note on the relative value of feeding stuffs in the *Journal of the Board of Agriculture* of England, for June 1915, contains a useful list in which the different feeding stuffs are arranged in order of average price per food unit. The following have been selected from the list on the assumption that they will prove of interest to the West Indian reader: Soya bean cake, 1*s.* 3½*d.* per food unit; coco-nut cake, 1*s.* 5½*d.* per food unit; palm nut kernel cake, 1*s.* 5¾*d.* per food unit; decorticated cotton cake, 1*s.* 6*d.* per food unit; rice meal (Burmese), 1*s.* 10¼*d.*; maize (Argentine), 1*s.* 10¼*d.*; maize (American), 1*s.* 11¼*d.*; beans, 2*s.* 0¼*d.*; oats (Argentine), 2*s.* 10½*d.*; oats (English), 3*s.* 1½*d.*

The Progress of Fiji.—Some interesting facts, showing the progress and prospects of Fiji, were given in the address of the Governor to the Legislative Council some time ago, in which he stated that the cost of the Agricultural Department had increased from £665 in 1905 to £6,244 (estimated) in 1914. Referring to a recommendation made in his address in 1912, that planters who have suitable land and sufficient funds at their disposal should experiment in the cultivation of limes, he pointed out that the lime industry of Dominica in the West Indies was valued in 1912 at £97,142, and that the area of land under lime cultivation was only 3,300 acres, which gave an approximate return of £30 per acre. Canada, the United States of America, Australia, and New Zealand, he said, afforded ready markets for the sale of limes both ripe and green, lime juice, citrate of lime, and essential oils, so that the permanent character of the lime industry must commend itself to those agriculturists who desire a safe investment for their capital and could afford to wait four or five years until the first crop could be gathered. (*Journal of the Royal Society of Arts*, April 16, 1915.)

Natural Mosquito Control.—The following letter has been taken from the *Journal of the Royal Society of Arts* for April 16:—

With regard to the extermination—or, at all events, the discouragement— of mosquitoes, it may be of interest to state that at Honolulu, some years ago, the experimental growing of a species of *Lemna* (duckweed) was tried on small surfaces of water, with a view to preventing female mosquitoes from gaining access to the water for purposes of depositing. I understand that the experiments were successful in demonstrating the efficacy of the method. The duckweed leaves become so closely matted together on the surface of the water, and the roots beneath it, that it is virtually impossible for any insect to penetrate the skin thus formed. Not many years ago I recollect seeing a mill-dam on the Avon, near Coventry, of large extent, absolutely covered with a species of duckweed. So thick and firm was the shin, that numbers of moor-hens were walking about on the surface.

THE DEVELOPMENT OF MONTSERTAT.

An instructive article by Dr. Francis Watts, C.M.G., will be found in the current issue of the *West Indian Bulletin*, in which the writer gives a review of progress in the different agricultural industries of the Presidency during the past ten years. The article in question constitutes a continuation of a previous one in the Bulletin (Vol. VII, pp. 1-15), where agricultural conditions and progress of the Presidency are reviewed in detail up to the end of 1904.

An examination of the average annual value of exports for five-year periods, from 1870 to 1914, brings out the point that the first three periods, namely, 1870-4, 1875-9, and 1880-4 show a fairly uniform value of exports of £32,000 to £33,000. This may be taken as representing the condition of the island at a period when sugar was the principal crop, and conditions were reasonably normal. The next period, namely 1885-9, shows a considerable falling off in value, being only £23,542—a fall of 30 per cent. This is accounted for by the difficulty experienced by the sugar industry, which then suffered a serious decline in values, beginning in 1883.

As a consequence of this, several sugar estates went out of cultivation about this time.

The following period, namely that from 1890-4, shows some improvement; this may be mainly attributed to the efforts that were made to maintain the sugar industry, and this largely through the attempts to restore the cultivation and to improve the sugar-making machinery on the large group of properties known as the Irish estates. These efforts, however, proved unsuccessful, consequently the period 1895-9 shows a serious decline, followed by a still more serious decline in the period 1900-4. The decline of the first of these two periods was mainly due to the collapse of the sugar industry, and the increased decline of the latter to the effect of the disastrous hurricane of 1899. In the year 1900 the value of the total exports fell to the alarming figure of £8,287 or about one-fourth of the normal value of the period first considered in this review.

Consideration may now be given to the last two periods of five years. The average annual value of the exports during the period 1905-9 was £31,649, being more than double that of the preceding period, while in the succeeding period, 1910-14, they rose to £41,068, the highest attained.

The writer gives a table in which are set out the values of the principal items of exports for the ten years 1905-14. Inspection of this table at once shows that the increase in the value of the exports is due to the development and extension of the cotton industry. The story of the restored prosperity of Montserrat is clearly the story of its cotton industry. In consequence of this, there is good reason for anxious thought as to the future, now that the cotton industry is depressed owing to the disturbed condition of trade as a result of the present European war.

Before suggesting other crops that may in the future take the place of cotton to some extent, Dr. Watts gives a table of figures showing the acreage under cotton, the quantity shipped, and the average yield per acre for the last ten years. This table is of considerable interest, and is reproduced as follows:—

COTTON IN MONTSERRAT.

	Acres.	Quantity shipped in lb.	Average yield per acre in lb.
1902-3	150		
1903-4	700	31,666	45
1904-5	600	70,723	117
1905-6	770	98,262	127
1906-7	1,000	160,000	160
1907-8	2,100	360,000	171
1908-9	2,250	224,711	99
1909-10	1,600	235,021	146
1910-11	2,050	402,666	196
1911-12	2,700	346,568	128
1912-13	2,063	290,390	140
1913-14	2,200	293,627	133

The increasing interest taken in the industry is exhibited by the increasing number of acres devoted to the crop. It is seen that confidence was being shown in the industry in 1903-4, but this rather waned the following year when a somewhat smaller area was planted; but confidence was soon restored and increasing areas were planted from 1905-6 up to 1908-9. The cause of the shaken confidence in 1903-4 was the outbreak of new and imperfectly understood diseases of the cotton plant, particularly leaf-blister mite and certain boll diseases. The restored confidence indicates the manner in which knowledge of the methods of controlling these troubles was acquired and applied, and is eloquent testimony to the good work done in studying the life-histories of the pests and diseases, and in devising methods of control which were carried out by the scientific and agricultural officers of the Agricultural Department, and by the planters, all working heartily together to a common end.

The year 1909-10 shows a marked falling off in the acreage planted, and the cause is plainly indicated in the small yield per acre recorded for the previous year. This diminished yield was chiefly occasioned by the occurrence of a severe gale in September, which swept over most districts of the island, uprooting large numbers of cotton plants, and destroying large areas: confidence was again soon restored, however, for it is to be seen that the area planted in 1910-11 showed a large increase, followed by a still larger increase in the next season, when the area planted reached a maximum. It will be noticed that the fluctuation in the area planted is governed to a large extent by the average yield of cotton per acre; a poor return in one year is followed by diminished planting in the next, and conversely, a good yield per acre induces increased planting.

The acreages planted by the larger estates do not vary so considerably; a steady policy of planting is more or less adopted; the variations noticed largely indicate the varying interest of the small grower and the peasants in the crop.

Turning now from the subject of cotton to a consideration of other industries, it is pointed out that lime cultivation continues to be the one next in importance at the present time to that of cotton growing. The sugar industry has shown no signs of recovery, the amount of sugar exported having but small value. It is important to remember that much attention has been directed to the export of live-stock from Montserrat; the values of these exports now exceed the value of sugar, and with improved breeding and organization, it is likely that the live-stock industry in Montserrat could attain still greater proportions. Lastly, it is mentioned that the production of papain is still being carried on as a minor industry and shows signs of considerable extension in the future.

The writer goes on to point out that if the position as regards cotton were normal, Montserrat might be regarded as flourishing. But in spite of the gauranteed minimum price for next year, the cotton market cannot for the present be safely depended upon, at any rate for second grade cotton. Hence it becomes important to look around for suitable crops and industries which, if necessary at any time, may take the place of the staple. In many islands of the West Indies increased attention is being given to the cultivation of Indian corn, and it might be possible in the near future for Montserrat to follow the example of Antigua in the matter of erecting a kiln-drying establishment so as to enable this commodity to be stored for considerable periods and even shipped from the island. Another crop the cultivation of which has recently been advocated is the Lima bean, which now forms an important crop in parts of California. The cultivation of this bean seems to offer much attraction to West Indian cultivators, and the prospects are that the industry could be carried on in Montserrat to very considerable advantage.

Attempts are being made to develop the onion industry in the West Indies. The success which has attended co-operative efforts in Antigua has caused may people in Montserrat to give consideration to onion growing on a larger scale in that Presidency.

Another industry which is attracting attention is the cultivation of Bay trees for the production of essential oils, and finally the suggestion has been made that Montserrat should play a part in the scheme for the production of pork and bacon in the West Indies, which may materialize with the return of more normal times.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture' Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of ankylostomiasis, more commonly known as hook-worm disease. Its cause, prevalence, and means of eradication receive attention.

On page 226 will be found a review of a recent book by Dr. Prinsen Geerligs entitled Practical White Sugar Manufacture.

Some interesting information concerning minor crops appears on pages 228 and 229. Amongst those considered are onions, maize, and indigo.

Insect Notes deal with the subject of cotton stainers and stained cotton. In Fungus Notes the article on the internal disease of cotton bolls, the first part of which appeared in last issue, is concluded.

Research at Rothamsted: 1914.

In the Annual Report of the Rothamsted Experimental Station for 1914, Dr. E. J. Russell (the Director) furnishes a useful review of the latest principles of soil chemistry. At Rothamsted two general methods of investigation are adopted—the operations of the best practical men are studied; and experiments are made to discover precisely the plant's requirements. The first often furnishes useful ideas, but the second generally gives more precise information, and frequently purely academic investigations have been the means of solving practical problems.

Water-supply is a factor of the first importance both as regards the supply of mineral nutrients and the activity of micro-organisms. Recent research has furnished important results concerning the evaporation of soil moisture (see *Agricultural News*, Vol. XIV, p. 205) and work on the soil atmosphere has been equally profitable. In the latter connexion it has been found, for instance, that there is a second atmosphere dissolved in the soil moisture and colloids, and that oxygen is used up in this 'water-atmosphere' more rapidly than it is renewed by solution from the free air.

Much has been done in regard to the effects of lime and chalk, but the precise effects of these substances are still to be determined. New ideas have arisen concerning methods of soil analysis. The usual method of extraction of acids is apparently being displaced by a process of absorption. The reaction between dilute acids and soils appears to be essentially a displacement of absorbed material by something which is itself absorbed. Hence, by this view, any agent capable of being absorbed by the soil can be used at any rate for the extraction of bases. In fact it has been found already that ammonium nitrate dissolves as much potassium, calcium, etc., as an acid does.

Universities in the Tropics.

The interesting sketch of the late Dr. Treub's energetic work in connexion with the promotion of botanical research in Java, which appears in *Tropical Life* for April 1915, calls to mind the striking circumstance that educational movements in the tropics have been almost entirely foreign in origin. In other words, countries like the United States and Holland have been the pioneers as regards the establishment of public institutions for agricultural research. The Philippines possess a large university in which agriculture holds the status of an important faculty; Porto Rico has an agricultural college, which, though in its infancy, may be expected nevertheless to develop successfully; and as *Tropical Life* points out, Holland made Buitenzorg a centre for the study of tropical botany in the East.

The striking feature of Dr. Treub's constructive work in the promotion of agricultural research was its international character. Not content with providing facilities for local students, Dr. Treub founded the

Foreign Laboratory at Buitenzorg, and since 1885 until the present day 150 foreigners have made use of it.

In the British colonies the Governments have achieved a great deal by means of Departments; but official establishments possess disadvantages as well as advantages. Full development, socially and economically, demands university influence.

'Onion Cultivation'.

The above is the title of a new Pamphlet on onion cultivation, prepared by Mr. T. Jackson, Curator, Antigua, and recently issued by this Department. In this a brief history of the cultivation of the Bermuda variety of onion in the West Indies, together with useful information as to the type of soil and rainfall requisite for the successful production of onions possessing good marketable qualities is given. Other matters dealt with are seed and varieties, manuring, propagation, seed beds, transplanting and establishing of crop, planting *in situ*, planting by means of sets, watering, tools, harvesting, yield, insect pests, etc., curing, curing house, grading, stringing and plaiting, packing, shipping, crates and markets.

Onion cultivation has undergone considerable extension in Antigua during the past two years. This is more or less directly due to the formation, at the end of 1913, of an Onion Growers' Association, consequent on whose instrumentality there has been an increasad production of this crop for export, as is shown by the fact that 6,557 crates were exported in 1914 as against 4,406 in 1913. It might also be mentioned that a movement is now on foot for the formation of a similar Association in Montserrat, where the industry has also been taken up and there have been successful shipments recently of crates of onions to Canada.

The information given in this pamphlet should be found especially useful to onion growers in the Leeward Islands.

Dipterocarp Forests.

An important memoir on the Dipterocarp forests of the Philippines has recently been published as No. 5 of Section A, Vol. IX, of the *Philippine Journal of Science*. The forest is a tall tropical, lowland forest characteristic of the inter-Malayan regions, usually occupying the localities most favourable to tree growth. It receives its name from the fact that species of the family Dipterocarpaceae are the dominant trees. The forests may be composed almost wholly of one dipterocarp species, as in some of the forests of *Shorea robusta* of Northern India, and of *Dipterocarpus tuberculatus* of Burma. In other cases two or more different species may predominate.

The importance of the dipterocarp family as a source of timber supply of the Philippine Islands is very great. One hundred and forty-four out of a total of 200 billion feet of standing timber in the Philippines is estimated to be dipterocarp. The large size of the individual trees, the density of the stand, and the readiness with which the market receives the timber for construction and finishing work of all kinds makes the forest an extremely important one, and capital has already been invested in the commercial development of this forest to a very considerable extent.

It is stated that certain grades of dipterocarp timber can be used in place of woods like walnut and mahogany, while other grades furnish excellent constructive timber; these two uses make the exploitation of the forests on a large scale almost a certainty.

Lectures at the Imperial Institute.

Mention was made in an editorial in this Journal some months ago of the fact that arrangements had been made for lectures to be delivered in the Colonial Galleries at the Imperial Institute. In this connexion the following paragraph, taken from the current issue of the *West India Committee Circular*, will be of interest.

'Dr. Gray, the whilom head of Bradford College, who has been recently appointed lecturer at the Imperial Institute, delivered his lecture on the West Indies and British Guiana at that Institution on Wednesday last. The audience, which was limited to fifty and amounted to twenty-eight, was very enthusiastic in their interest in the matter of the lecture. No doubt the lecturer will follow up his lecture by a visit to the West Indies, which should, in the circumstances, be of especial interest to him.'

It may be pointed out that while Dr. Gray may not have yet visited the West Indies, he has travelled extensively, it is understood, in South America. The institution of these lectures is calculated as likely to do much good in the way of enlivening the Galleries, and their great educational value in the matter of teaching commercial geography is certain to be felt.

Jamaica as a Centre of Botanical Research.

A lengthy article in *Nature* for June 17, 1915, calls attention to the splendid facilities and accessible nature of Jamaica as a centre of botanical research. Special advantages are provided by the circumstance that the Jamaican Government has leased the so-called Cinchona Station to a committee of the British Association for the advancement of Science. This Station, known also as Hill Gardens, was at one time the headquarters of the local botanical department, but is now the least important, economically, of the agricultural and botanical stations maintained by the Government.

The article in question gives a good general account of the flora around Cinchona, and shows that it is very rich in botanical interest. The committee referred to rents a bungalow at the Station, and botanists desiring to make use of it should apply (with suitable credentials) to Professor Bower, University, Glasgow.

INSECT NOTES.

COTTON STAINERS AND STAINED COTTON.

That cotton stainers injure cotton is generally believed in all the West Indian islands where cotton is grown. These insects occur in all these islands, except Barbados, and in that island one of the objects of the quarantine against imported cotton seed is to prevent the introduction of these insects.

Two articles by Mr. Nowell, one of which appears in the present issue of the *Agricultural News*, deal with the occurrence in Montserrat for several years past, and in Tortola, and more recently St. Vincent, of diseases of cotton bolls. These have been known under different names such as black boll, boll rot, and internal boll disease.

Although at first no connexion could be traced between these diseases and cotton stainers, the evidence available at the present time seems to indicate that the diseases, or some forms of them, may be associated with the attacks of stainers.

This evidence is now so strong that Mr. Robson, Curator of the Botanic and Experiments Stations, Montserrat, is attempting to start a vigorous campaign against the cotton stainers in that island. It is suggested that the energetic collecting of these insects should be undertaken as soon as the first stainers appear in young cotton fields, in order to check as far as possible, the rapid increase which often takes place as a result of the breeding of the first and second generations.

While it is recognized that opinions may differ as to the method to be employed, Mr. Robson recommends the use of a collecting funnel such as that shown in the accompanying

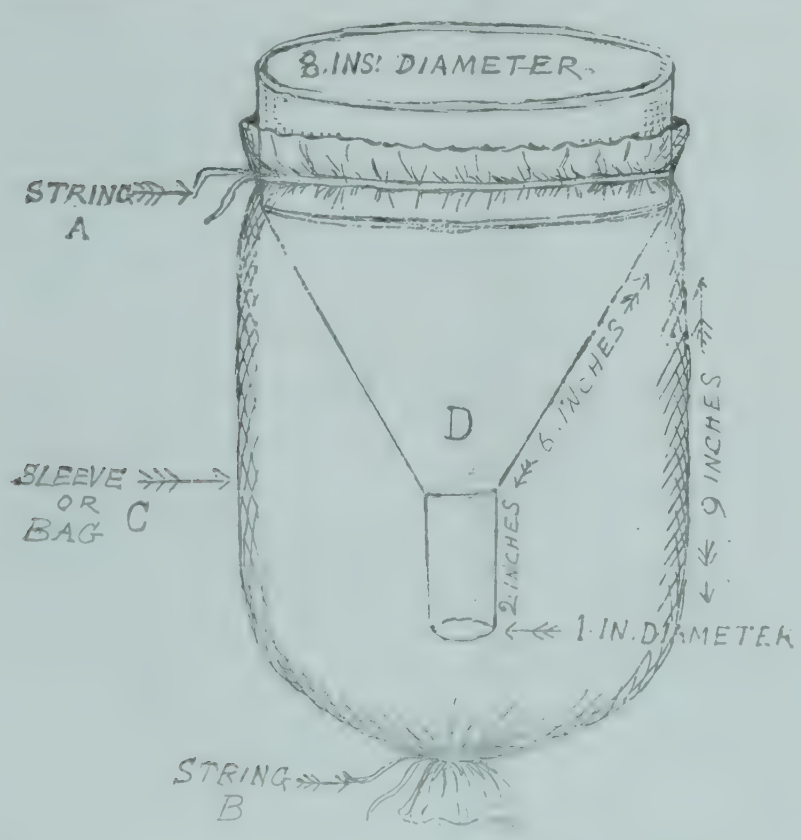


FIG. 11. COLLECTING FUNNEL.

figure. This trap was devised by Messrs. Guppy and Thornton, a figure of it appearing in their paper on the Cotton Stainer Bug, Circular No. 6, Board of Agriculture, Trinidad and Tobago. The insects are jarred or knocked from the cotton plants into these funnels: by opening the sleeve at the bottom, the stainers may be emptied out and killed.

This plan of an early crusade against cotton stainers should be taken up in every locality where cotton stainers usually become abundant, or where boll diseases are common, or where from any cause considerable loss is experienced from stained cotton. Every stainer killed early helps to keep down numbers, and it certainly should be easier to keep down the numbers than to reduce these numbers when they have become abundant.

H.A.B.

THE ADVANCE OF AGRICULTURE IN THE UNITED STATES.

A report by Mr. D. F. Houston, United States Secretary of Agriculture, in the Yearbook of the Department for 1914, provides a most interesting review of the various advances that are being made in connexion with the rural industries of the republic. As would be expected, the report is entirely economic in nature, and is principally designed to show how the Government is expending energy and money to improve the position of the farmer.

Dealing first with aspects of production, the Secretary points out that progress reveals itself more particularly in the diversification of agriculture, in the rise of minor crops to larger proportions, than in the increased production of staple products. For example, dairying in the last generation has risen to the position of an exceptionally important part of American agriculture to-day. Similar advance has been made in regard to vegetable production.

In considering the standard of yields obtained, it is realized that the American farmer does not produce as much per acre as the farmer in a number of other civilized nations; but production per acre is not the American standard. The standard is the amount of produce for each person engaged in agriculture, and by this test the American farmer appears to be from two to six times as efficient as most of his competitors. Continuing, it is stated: 'relatively speaking, extensive farming is still economically the sound programme in our agriculture, but now it is becoming increasingly apparent that the aim must be, while maintaining supremacy in production for each person, to establish supremacy in production for each acre.'

A number of instances are given to indicate the manner in which the experts of the different Bureaus render valuable assistance to the farmer, enabling him to surmount difficulties, and to produce greater yields.

The meat supply of the country on account of its somewhat critical condition receives attention in a special section. Problems relating to this question come within the activities of the Bureau of Animal Industry, and although it is appreciated by Mr. Houston that these have been intelligently and zealously attacked, it nevertheless remains true that the United States faces a serious situation in the matter of its meat supply. The greatest hope for a considerable increase in the nation's meat supply lies in five directions: first, in helping the cattlemen to develop further the big ranch; second, in a more satisfactory handling of the public grazing lands: third, in systematic attention to the production of beef animals in the settled farming areas of the country, particularly in the south: fourth, in increased attention to the smaller animals, such as swine and poultry; and fifth, in the control and eradication of the cattle tick, hog cholera, tuberculosis, and other animal diseases and pests.

After recording a large number of statistical statements concerning live-stock production, as well as reviewing the work of tick eradication which is progressing satisfactorily, the writer mentions the existence of the Office of Farm Management, the function of which is to show the farmer the right way of examining his business in order to see what lines are profitable, and what are unprofitable.

The constructive agricultural programme arranged by the United States Government must of necessity provide a place for distribution as well as production. The distribution side of agriculture is of quite recent growth, and this growth has been fast in the United States, being five years ago practically unrecognized. The Office of Markets performs the duty of recording the different market associations and co-operative concerns, and in establishing wherever possible the co-operative sale of produce. The conclusion is arrived at that in communities where farmers' associations are properly constituted and operated, better results are obtained than under a system of individual handling. Advantages present themselves in the standardizing and packing of products, and in the discovery of the best daily market. A special object of enquiry by this Office has been the possibility of marketing by parcel post and express, and it has been found that where proper care in packing and handling is exercised, the marketing of certain commodities by parcel post and express can profitably be undertaken. Coming under the heading of distribution is the subject of grain and cotton standards. This work is realized as being most important and has engaged the attention of experts of the Bureau of Plant Industry for years. It is pointed out that the farmer cannot be expected to improve his methods unless it can be clearly demonstrated that it will pay him to improve his product and his handling methods. Concrete evidence of the profitableness of this course in the form of larger net returns for his output will do more than anything else to arouse active interest. At the same time, whatever the yield, a satisfactory price for produce can only be secured by the establishment of standards, and much progress has been made in this way by the United States Department. In the grain belt the Government grades for corn have already been adopted, and in connexion with cotton, apart from the continuance of the standard grade system, an investigation of the spinning value of these grades has recently been undertaken. Furthermore, in connexion with the same crop, an important Act has just been passed, which also tends to simplify and regulate proper marketing. This Act provides that future contracts must be based on uniform standards established by the Department of Agriculture, and prohibits the *pro forma* deliveries and the tendering of cotton of less than $\frac{7}{8}$-inch in staple in settlement of future contracts; and makes various other provisions designed to make the sale of cotton scientific rather than speculative. The Act, as a whole, is constructive and regulatory; not destructive or oppressive.

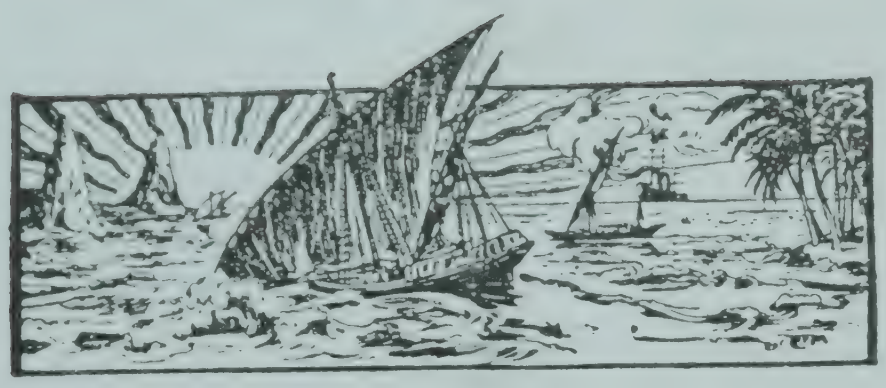
The subject of rural credit in the United States is not one about which we have heard a great deal, and the section which Mr. Houston provides is therefore of considerable interest. Speaking briefly, there are two systems advocated: first the establishment of a proper land mortgage banking system operating through private funds; second, legislation authorizing and encouraging local personal co-operative credit associations. Some estates have already taken steps in this direction, and others are contemplating taking them. Mr. Houston points out in reference to such proposed associations, that it is of the utmost importance that attention be centred on the use which may be made of borrowed money It is strongly maintained that there should be guarantees of the use of funds secured for productive purposes on the farms covered by mortgages or other obligations.

One of the last matters dealt with in this interesting report is the dissemination of information. The publications of the United States Departments are familiar to those engaged in agriculture in most countries, but it may not be realized that a great deal of work has been done to reduce wastage in the distribution of these publications amongst the people of the United States. Every effort has been made to drive home information in a suitable form for mental digestion, and co-operation has been effected between the department and the press with a view to popularizing agriculture for the country's benefit. This work belongs to the Office of Information.

One of the most progressive steps that has ever been taken in connexion with agriculture, is the passing in the United States of the Co-operative Extension Act. It has long been realized that bulletins, circulars, and press notices conveying information for farmers, no matter how excellent they may be and how numerous, will not solve the problem of reaching the farmer and of inducing him to adopt the best methods. Personal contact, in this field of education, as in others, is essential. The method of demonstration by competent individuals to farmers *on their farms* has been tested by the department for many years. It has been justified by its results, and has been formally sanctioned by Congress in the recent Act referred to above. The Act provides for the appropriation of large sums of money for this farm to farm demonstration work, and in 1922-23 there will be a total annual expenditure of $8,680,000. This sum will have to be expended in direct instruction in the field, as the Act is very specific in prohibiting its use for teaching, or erecting buildings at institutions, and in limiting the proportions that can be expended in printing bulletins.

The last matter dealt with in the report is the recent reorganization of this great Department. Part of the work of certain Bureaus has been transferred to others, and in certain cases the names of offices have been changed. For instance, the Office of Experiment Stations has been altered to State Relations Service. A useful transfer seems to be the removal of the Office of Farm Management from the Bureau of Plant Industry, to the Office of the Secretary, since the work of farm management is more essentially economic than botanical. The general principle underlying this reorganization, or rather its most important feature, is the definite outline or segregation in each Bureau of three groups of activities—the regulatory, the research, and the extension. In the allocation of work, pains will be taken to assign those who have research talent to the investigation work; those who have administrative ability to the regulatory; and those who have special talent for the direction of extension work, to that entirely. There is good reason for believing that the redirection and relocation of the work as proposed in the report under review will result in a marked increase in the efficiency of the labours of the department.

In drawing this review to a close, it may not be inappropriate to call the reader's attention to the very comparable nature of some of the phases of development in the United States with those in the West Indies. particularly in regard to the rise of minor crops, the distribution of produce, co-operative methods generally, and the dissemination of information. Regarded from a West Indian aspect, the 1914 Report by the Secretary of Agriculture is particularly suggestive, and will doubtless prove stimulating to those engaged in the direction of agriculture, in this and other parts of the tropics.



GLEANINGS.

It is stated in the *Louisiana Planter* for June 5, 1915, that next year Cuba will produce over 3,000,000 bags of sugar made in electrified factories. The same journal referring to sugar in Europe puts the beet crop reduction for next year at about 15 to 20 per cent.

Efforts are being made in Cyprus to extend the cultivation of certain spices like Coriander, Carraway, and Fenugrec. Cultivation experiments are soon to be started and the Imperial Intitute has offered to receive samples of the produce for examination and valuation. (The *Cyprus Journal*, April 1915.)

Herbarium specimens of the mistletoe which attacks lime trees in Dominica have recently been determined at Kew as *Dendropemon caribaeus*, Krug et Urban. Apparently *D. caribaeus* is a synonym for *Loranthus emarginatus*, a description of which will be found on page 312 of Griesbach's *Flora of the British West Indies.*

The *Perfumery and Essential Oil Record* for May 1915, refers to the rising market for distilled lime oil. It is mentioned that this matter was referred to in the last two issues of that journal, and has been further evidenced since the last issue by the price 4*s.* 3*d.* reported, paid; for large quantities of hand pressed 6*s.* 6*d.* to 7*s.* would buy, but 7*s.* 6*d.* was wanted for smaller lots.

In the issue of *Nature* for June 3, 1915, appears a review of the *Flora of Jamaica*, Vol. III, Dicotyledons: Families Piperaceae to Connaraceae, by W. Fawcett and Dr. A. B. Rendall, of the British Museum. Although the work is essentially systematic, it is mentioned that here and there economic and other untechnical notes are introduced, as in the Anonaceae. The price of the volume is 15*s.*

In the *India Rubber Journal* for June 5, 1915, appears an article by Dr. H. P. Stephens on the function of litharge in the vulcanization of rubber. It is shown that the addition of litharge in moderate quantities increases the coefficient of vulcanization, but increasing proportions cause a progressive reduction in the coefficient of vulcanization.

Published in the Dominica *Official Gazette* for June 14, 1915, is the annual report on the vital statistics of the Colony. It is estimated that the population of the Colony on December 31, 1914, was 36,645. The birth rate for 1914 was 37·84 per 1,000 against 34·70 per 1,000 in 1913. The death rate for 1914 was 20·30 per 1,000 against 24·17 in 1913.

The effect of the cattle tick upon milk production of dairy cows is the subject of *Bulletin No. 147* of the Bureau of Animal Industry, United States Department of Agriculture. It was found that at the conclusion of the tests tick-infested cattle gave only 65·8 per cent. as much milk as the tick-free. The tick-free group gained 6·1 per cent. in body weight; the tick-infested gained 3·6. Spraying temporarily reduces the milk yield.

According to the Demerara *Daily Agrosy* (Mail Edition), for June 26, 1915, great success has attended the sinking of a new artesian well at Onderneeming Industrial School. It was expected that four or five weeks' drilling would be necessary to reach water, which would mean boring to a depth of over 1,000 feet, but it was found that good water was obtainable at a depth of only 320 feet. The artesian well at Onderneeming is the shallowest in the Colony.

In feeding experiments with ten dairy cows, in which hay and wheat bran constituted the basal ration, and gluten feed and coco-nut meal the supplementary feeds, substantially the same results in milk yield and slightly more butter fat were obtained from the coco-nut meal than with the gluten feed ration. In amounts of from 3 lb. to 4lb. daily per head, coco-nut meal is considered to be a desirable dairy feed in Massachussetts. (*Experiment Station Record*, January 1915.)

The Act to regulate the registration and inspection of commercial fertilizers, fertilizer materials, and chemicals in Porto Rico will be found reproduced in Bulletin No. 3, of the Board of Commissioners of Agriculture, Porto Rico. In this publication also is given the results of analyses made in connexion with this law. It appears that from eighty-seven fertilizer analyses, twenty-three were found short in one or more constituents. Phosphoric acid was up to the guarantee in all but four samples, and in many samples was above.

Information is published in *The Board of Trade Journal* for May 27, 1915, to the effect that the shortage of the supply of synthetic indigo and the consequent high prices for imported indigo have led to a revival of the native production of indigo in various parts of China. It is impossible to estimate the increase in the production of the dye, but it is well to recognize that indigo production is one of China's oldest industries. It is unlikely, however, that there will be any of the product available for export, for the time being at any rate.

Reference is made in *Nature* for June 10, 1915, to the recent discovery that X-rays can be defracted into spectra by the natural grating contained in the ordinary structure of crystals, which sets at rest the question as to the nature of these radiations. They are of the same nature as light waves, but of very much higher frequency—from 10,000 to 100,000 times as high. On the living cell X-rays produce remarkable effects. The study of these effects in plants has shown that the rays may retard cell division, and more especially affect the germinating embryo. When present in large amounts, they may kill such cells but, on the other hand, may in very feeble doses have a stimulating effect upon cell division.

ALCOHOL AS FUEL IN CUBA.

Possibly as the result of Mr. Nöel Deerr's report on the Cuban sugar industry (reproduced in the *West Indian Bulletin*, Vol. XIV, No. 4) practical trials have recently been made in Cuba to run engines on alcohol made from exhausted molasses. Readers will remember that we published an editorial on the subject in the last issue but one of this journal, and strongly advocated the carrying out of such demonstrations in the British West Indies.

The following information is taken from the *Louisiana Planter* for May 29:—

Expensive experiments are being carried on by Messrs. Levy of Havana and Matanzas, looking toward the utilization of alcohol here in place of gasoline to supply the motive power for automobiles, tractor ploughs and other engines that are now gasoline driven. Thus far these trials have been eminently successful, for not only have they succeeded in operating such internal conbustion engines by means of alcohol, but are doing so at much less cost than with gasoline. Besides the satisfactory experiments they have made with Ford automobiles (which are to a large extent replacing the time-honoured *coches* that are a feature of every Spanish-American city,) a prominent ingenio owner between here and Matanzas, since changing from gasoline to alcohol, reports that he is saving more than $10 a day in the cost of operating a big tractor that he uses for ploughing.

The United States Department of Agriculture has issued a very useful and instructive *Farmers' Bulletin* as No. 638, describing laboratory exercises in farm mechanics. These lessons are intended for agricultural high schools and are very practical and, in many cases, original. In each exercise the equipment needed is stated, and then instructions are given as to how to proceed. Ropework figures as a feature, including the tieing of different knots and the employment of rope in the control of animals. Other exercises concern the naming of parts in various farm implements. Surveying, drainage, irrigation, and building construction are also included. Concerning the last named branch of the subject of farm mechanics, useful instructions are given as to the building of a portable hog house, and it is noticed in this and in other exercises that reference is made to previous *Farmers' Bulletins* for more detailed information, and advice is often given to communicate with the local State Agricultural College.

The publication here considered might be used with advantage in some of our West Indian schools. Some of the exercises are sufficiently simple and inexpensive to be used in the higher standards of the elementary schools provided arrangements could be made for giving this kind of instruction. In the West Indies much of the work could be easily done out of doors in the school gardens.

Manurial Experiments with Bananas in Queensland.—The Under Secretary of the Department of Public Instruction of Queensland has authorised the publication in the *Queensland Agricultural Journal* for May 15, 1915, of the results obtained in the banana manurial experiments at one of the State Schools near Buderim Mountain. Briefly, it is shown that as the supply of food in the soil is used up in the no-manure plot, the returns show a decided falling away, which will be greater each year. From this it is concluded that banana growing even on fairly good land soon becomes unprofitable if systematic manuring is not resorted to. An examination of the table of figures shows that the monetary gain after paying for manure, per acre, was as follows for 1913-14: No potash, £18 3*s.* 7*d.*; complete manure No. 1, £53 3*s.* 11*d.*; Complete Manure No. 2, £16 1*s.* 5*d.*

DEPARTMENT NEWS.

Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, and Mr. W. Nowell, D.I.C., Mycologist, returned to Barbados on July 14 by the C.R.M.S. 'Caraquet' from Montserrat where the above officers have been conducting investigations in regard to plant pests and diseases.

The Russian Government, according to the *International Sugar Journal* for May 1915, is offering prizes for the invention of better denaturants for alcohol. The new denaturant should be a substance possessing a repugnant physiological action on the would-be drinker, while at the same time it should be incapable of spreading any danger whether by fumes or by possessing products of spontaneous combustion, and incapable likewise of being easily separated by simple methods from the spirit in which it is combined. The question of a suitable denaturant for industrial alcohol is of importance in connexion with the proposed manufacture of alcohol from molasses, and it would seem to be a point to which sugar chemists might profitably turn their attention.

A special number of the *Perfumery and Essential Oil Record* for June 11, 1915, contains or rather consists of a valuable epitome of essential oil knowledge completely up to date. It surveys the sources, constituents, separation, chemistry, characters, analyses, and sophistication of the aromatic distillates in the light of the most recent information, and its comprehensive and modern nature will secure it an immediate place among the reference books of those interested in essential oils. A great deal of the matter is based upon lectures delivered to the Pharmaceutical Society by Sir William Tilden, Professor W. H. Perkin, and Mr. J. C. Umney (Editor of the Journal).

According to the *Journal of Agriculture* of New Zealand, for April 20, 1915, a satisfactory machine is now on the market for harvesting maize for silage. Not only does the mechanical harvesting of maize effect great economy in labour and time, but, most important of all, it enables the process of silage on a large scale to be carried out in a shorter space of time, and with the desired efficacy.

FUNGUS NOTES.

THE INTERNAL DISEASE OF COTTON BOLLS.

(Concluded.)

In March 1911, Mr. W. Robson, Curator from 1905 of the Botanic Station at Montserrat, in the course of correspondence concerning the incidence of bacterial blight due to *Bacterium malvearum* in that island, submitted specimens of what appeared to him to be a distinct boll affection. Mr. F. W South, Mycologist to this Department, examined these and noticed in the majority of the bolls the association of discoloured lint with proliferations of the inside tissues of the walls, bacteria being present in some of the more decayed specimens. He regarded the existence of the proliferations as suggestive of damage by sucking insects. It may be stated here that the occurrence of such proliferations in cotton bolls attacked by plant bugs appears to have been first described and figured by Dr. A. W. Morrill (United States Department of Agriculture Bureau of Entomology, Bulletins 54, 1905, and 86, 1910). In the same month Robson called attention to the occurrence on two estates of large numbers of internally discoloured bolls. In response to a query by South he expressed the opinion that cotton stainers were not prevalent on these fields at the time of the observations. Further reference was made to the affection in the Report of the Montserrat Botanic Station for 1911-12, and in the same report the cotton stainer was said to be increasing in importance as a cotton pest, so that many planters had found it necessary to adopt means of control.

In December 1913, Robson's attention was again called to the subject by the presence of discoloured lint in the second crop of that season. He recorded the occurrence of cotton stainers, but regarded the apparent disproportion between their observed numbers and the amount of the injury as telling against the suggested connexion. Material collected at this time was examined by the present writer, who found the general appearance of the affected bolls to coincide in all particulars, except that of abnormal shape, with the description given by Lewton-Brain. Proliferations, as described by Morrill and mentioned by South, were found to be general in the affected bolls, and it seemed clear in some cases that the rot had commenced from these. Bacteria, as described by Lewton-Brain, were not present, but in all cases hyphae were found growing amongst the lint and in the lumina of the fibres. Spores of one type were present to a greater or lesser extent in all the examples, but their connexion with the hyphae could not be made out. They are one-celled, elongate, straight or more usually slightly crescentic, acuminate at one or both ends, measuring about 20 by 2 microns. They occur in irregular tufts or clumps, and adhere closely together. Attempts to obtain cultures from dried material were unsuccessful.

In January 1914, Robson confirmed the early account of the rapidity with which the affection developed by finding discoloured bolls to be quite general in fields which three weeks previous had been comparatively free. He notes the occurrence of the trouble on plots of hybrid St. Eustatius and on Sakellarides and other Egyptian types. Later he added to this list the Montserrat wild cotton (a form of the perennial *Gossypium barbadense*). He attributes to the effects of the disease the poor germination of seed from the second pickings which he had noticed for some years.

In May 1914, five experimental plots were started in Montserrat on lines suggested by the present writer to test the assumption that a definite fungous infection was concerned. Three plots of some fifty plants each were planted in close proximity; two of them with seed from stained bolls, treated with corrosive sublimate solution in one and untreated in the other; and one with seed from Barbados, where the affection is not known to occur. There was no material difference in the results of these three plots. The first crop, picked in September and October, gave a percentage of affected bolls which varied irregularly from 10 to 20 per cent. With the beginning of the 'second picking' on November 11, the number had fallen to zero on each plot (fifty bolls per plot examined) and it remained very low throughout the month. In December a rapid and regular rise took place, reaching the neighbourhood of 70 per cent. towards the end of the month, and maintained in the eighties and nineties in the two January pickings which concluded the experiment. The fourth plot, remote from the above, was planted with Barbados seed on land not recently in cotton. No staining whatever occurred during September, October, and November, but from early December onward the plot shared in the rapid rise which took place at the same time on the previously described plots.

During the course of these experiments Robson became convinced that the cotton stainer bug is the cause, or at least a necessary agent of the affection.

He gives as his reasons for this view: (a) the absence of the affection in situations where cotton stainers are not found, (b) the high percentage of affected bolls whenever cotton stainers are plentiful, (c) the constant association of proliferations on the inside of the carpels with the staining, and (d) the occurrence, in bolls in which staining is just commencing, of water-soaked spots taken as indicating punctures such as would be caused by the setae of the bug.

The history of the fifth of the plots above mentioned is interesting in this connexion. It was planted with Barbados seed on land where cotton grown the previous season had been heavily stained, and the rest of which was now in sugar cane. During September and October staining was recorded in two out of five examinations, namely 5 per cent. on September 12, 4 per cent. on October 12. Whether stainers were present on these occasions was not recorded. There was no staining during November. On the 27th of that month about 100 stainer bugs were artificially introduced. Affected bolls occurred at each examination during December and January, varying irregularly from 5 to 15 per cent. The bugs did not seem to find the situation congenial and are reported to have all disappeared by the end of December. The significant point is that while on all the other plots, which remained infested with the insects, the amount of staining reached 50 per cent. by the middle of December and culminated at the last observation in January at 92, 94, 84, and 73 per cent., respectively, the amount on the fifth plot did not go above 15 and ended at 5 per cent. Examples of the affected bolls from these plots were examined by the writer. In a small proportion of cases bacteria were dominant, in the rest fungous hyphae were abundant in the stained lint. The spores seen in the previous year were not found, which may or may not have been due to the poor state of preservation of the material. Nothing can be said, therefore, as to the identity of the fungus.

When he began to suspect stainers as the cause of the affection Robson tried to imitate their action by pricking about twenty bolls with a needle. Six days later they were put

into spirit and forwarded for examination. It was found that in most cases the appearance was not different from what one would expect from a merely mechanical injury to young seeds. A considerable number of the cells had been killed, and there was a stained spot, apparently free from organisms, on the lint around the wound. In certain cases, however, lint on the seeds adjacent to those actually wounded had become stained, and a rot had set in which involved or tended to involve the whole contents of a loculus. In three cases this rot appeared to be purely bacterial, in three others it was wholly or in part fungoid. No spores were seen in connexion with the latter.

An experiment carried out by Robson at the beginning of December tends to support the cotton stainer theory, though in the absence of proper controls it does not amount to proof. A plant was enclosed in a muslin-covered cage and 100 bugs introduced. At the time this was done the adjoining plant was examined and only one boll out of seventy-six was found to be damaged. A week later the cage was removed. The enclosed plant had then eighty-one bolls of which sixty-one showed more or less staining. The nearest uncovered plant had at the same time eighty-eight bolls of which thirteen were stained. Bugs were at this time present in the plots. The experiment was then repeated, the numbers obtained being as follows: nearest plant at time of enclosure, eight bolls stained out of sixty-five; enclosed plant at end of one week, forty-six out of eighty-six; neighbouring plant not covered, thirty-one out of seventy-seven.

Unless the effect of stainer injury depends on infection with organisms of limited distribution, it is obvious that the same affection should exist in other stainer-infested islands. Enquiries on this point made in the early part of the present year led to its recognition in Tortola and amongst the complex of boll rots induced by the wet climate of St. Vincent. From the latter island a number of full-sized green bolls, of sound appearance, were obtained near the end of the crop season. All had stained lint in one or more loculi, and in every case the discoloration appeared to be due to the growth of fungi or bacteria, the former being by far the more common. In the greater number of cases spores were present, often in large numbers, which were identical in appearance with those found in the Montserrat material of 1913-14. In a few of the St. Vincent specimens containing hyphae these spores were not found, and in others only bacteria in great abundance were seen. (It is remarkable that in three or four cases mites or their developing eggs were present in the bolls.) The discoloration of the lint appeared in every case to be associated with proliferated tissue on the inner surface of the wall of the boll, or on the radial divisions. The proliferations are like those figured by Morrill, and consist of rather loose parenchyma, the cells of which are dissociated toward the surface of the mass. No hyphae were detected in or between the cells of the proliferated tissue.

The general conclusion reached is that while the staining may be initiated by matter issuing from punctures in the young seeds, it depends for its extension on infection with a foreign organism, and that while in the majority of cases this appears to be a specific fungus, such infection is in some cases due to other fungi, or to bacteria.

There, for the present, the matter stands, and while further investigation is obviously necessary, the connexion of the affection with the activities of cotton stainers is so probable that measures for their control assume a greater importance than they have been hitherto realized to possess.

W.N.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of May:—

In the early part of the month business was fairly brisk, accompanied by the exchange of a large amount of goods; but later, the advent of fine weather and the occurrence of the Whitsuntide holidays had a lessening effect. The prices realized for most of the products that come under our review have also been satisfactory, most of the West Indian products having realized good prices.

GINGER.

This spice has maintained a firm position, rough brown Calicut has sold for 28*s.* per cwt. and washed rough Cochin for 30*s.*

MACE AND PIMENTO.

For the former there has been a quiet demand. At auction on the 12th of the month, 30 packages of West Indian were brought forward and 6 sold, fair palish and reddish fetching 2*s.* 2*d.* per ℔., fair reddish, partly broken, 1*s.* 8*d.* to 1*s.* 9*d.*, and broken 1*s.* 1*d.* to 1*s.* 4*d.*; 10 cases of reddish Java sold at 2*s.* 5*d.* per ℔.; 8 cases dull red, partly wormy Penang, were bought in at 2*s.* 3*d.* per ℔. Later in the month, 53 packages of West Indian were sold, good to fine pale realizing 2*s.* 2*d.* to 2*s.* 4*d.*, fair 2*s.* to 2*s.* 2*d.*, and ordinary 1*s.* 10*d.* to 1*s.* 11*d.*, while red fetched 1*s.* 8*d.* to 1*s.* 9*d.*, and broken 8*d.* to 1*s.* 8*d.* At auction on the 12th, 110 bags of pimento were offered at $2\frac{1}{8}d.$ per ℔., and all bought in.

SARSAPARILLA.

At the drug auction on May 13, sarsaparilla was in good supply; 39 bales of grey Jamaica were offered and 25 sold, fair fetching from 2*s.* to 2*s.* 1*d.* per ℔.; native Jamaica was represented by 8 bales, all of which sold at $11\frac{1}{2}d.$ to 1*s.* 1*d.* per ℔. for dull pale to fair red; 15 bales of Mexican were also offered, and 3 sold at $9\frac{1}{2}d.$ per ℔.; 19 bales of Honduras were also offered, 12 bales of which were disposed of privately.

CITRIC ACID, LIME OIL, LIME JUICE, KOLA, CASHEW NUTS.

Citric acid has remained very firm throughout the month at 2*s.* 6*d.* per ℔., and at the close of the month it advanced to 2*s.* $6\frac{1}{2}d.$ Fair West Indian distilled lime oil was sold at the beginning of the month at 4*s.* per ℔., but towards the close, in consequence of the small arrivals, the price had advanced to 4*s.* 9*d.*, and it was further stated that good West Indian distilled was not to be obtained. Lime juice also continues very scarce, 3*s.* 6*d.* per gallon being the price at which any quantity would sell. At auction on the 13th, 4 packages of West Indian kola were offered, and 2 sold at $4\frac{3}{4}d.$ per ℔. for fair bright dried to darkish halves; on the 19th, 4 barrels of dried West Indian were disposed of at 3*d.* per ℔. At auction on the 13th, 20 packages of cashew nuts were offered but none sold, and again on the 19th, 97 packages were offered and all were bought in at 40*s.* per cwt.

MARKET REPORTS.

London.—The West India Committee Circular, June 1, 1915.

Arrowroot—$2\frac{3}{4}d.$ to $4\frac{1}{4}d.$
Balata—Sheet, $2/4\frac{1}{2}$; block, $1/11\frac{1}{2}$ per lb.
Beeswax—No quotations.
Cacao—Trinidad, 82/- per cwt.; Grenada, 73/- to 79/-; Jamaica, no quotations.
Coffee—Jamaica, no quotations.
Copra—West Indian, £23 15*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, $14\frac{1}{2}d.$ to $17d.$
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 55/- to 70/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/- to 3/3; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations
Mace—$9d.$ to $2/11d.$
Nutmegs—$4\frac{1}{4}d.$ to $5\frac{3}{4}d.$
Pimento—$1\frac{7}{8}d.$ to $2\frac{1}{16}d.$
Rubber—Para, fine hard, $2/7\frac{1}{4}$; fine soft, $2/2\frac{1}{4}$; Castilloa, 2/-.
Rum—Jamaica, 3/- to 3/8.

New York.—Messrs. Gillespie Bros., & Co., July 2, 1915.

Cacao—Caracas, $14\frac{3}{4}$c. to $15\frac{1}{4}$c.; Grenada, $14\frac{1}{2}$c. to $14\frac{3}{4}$c.; Trinidad, 15c. to 18c.; Jamaica, 12c. to $12\frac{1}{2}$c.
Coco-nuts—Jamaica and Trinidad selects, $26·00 to $27·00; culls, $16·00 to $17·00.
Coffee—Jamaica, $7\frac{3}{4}$c. to 11c. per lb.
Ginger—12c. to 16c. per lb.
Goat Skins—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 38c. to 40c. per lb.
Grape Fruit—Jamaica, $2·50 to $3·25.
Limes.—$4·50 to $5·00.
Mace—48c. to 52c. per lb.
Nutmegs—$11\frac{1}{2}$c.
Oranges—Jamaica, $2·00 to $2·50.
Pimento—$3\frac{3}{4}$c. per lb.
Sugar—Centrifugals, 96°, 4·95c.; Muscovados, 89°, 4·30c.; Molasses, 89°, 4·17c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., July 12, 1915.

Cacao—Venezuelan, $15·50 to $16·25; Trinidad, $16·50 to 17·00.
Coco-nut Oil—83c. per Imperial gallon.
Coffee—Venezuelan, 12c. to 13c. per lb.
Copra—$3·75 per 100 lb.
Dhal—No quotations.
Onions—$1·20 to $2·25 per 100 lb.
Peas, Split—$12·00 per bag.
Potatoes—English $2·00 to $2·25 per 100 lb.
Rice—Yellow, $6·00 to $6·25; White, $5·60 to $5·75 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. T. S. Garraway & Co., July 12, 1915.

Arrowroot—$4·00 to $4·60 per 100 lb.
Cacao—$16·00 per 100 lb.
Coco-nuts—$16·00.
Hay—$1·90 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $85·00 per ton.
Molasses—No quotations.
Onions—$3·00 to $4·00 per 190 lb.
Peas, Split—$8·50 to $9·00; Canada, $5·40.
Potatoes—Nova Scotia, $4·00 per 160 lb.
Rice—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $6·25.

British Guiana.—Messrs. Wieting & Richter, June 26, 1915; Messrs. Sandbach, Parker & Co., July 9, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$10·00
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	14c. to 15c. per lb.	16c. per lb.
Cassava—	96c. to $1·20	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	——	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	$14\frac{1}{2}$c to 15c.
Liberian	10c. per lb.	10c. per lb.
Dhal—	——	——
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	4c. per lb.
Madeira	——	——
Peas—Split	$12·00 to $12·50	$13·00 to $14·00 per bag. (210 lb.)
Marseilles	——	——
Plantains—	16c. to 48c.	——
Potatoes—Nova Scotia	$4·00	$4·50
Lisbon	——	——
Potatoes--Sweet, B'bados	$2·00	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
Tannias—	——	——
Yams—White	——	——
Buck	$2·64	——
Sugar—Dark crystals	$3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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The Art of Nature Teaching.

AN important Paper, referred to as Circular 904, has been received from the English Board of Education, containing suggestions for the consideration of teachers and others concerned in the work of elementary science in primary schools. The suggestions are quite general in application, and they apply to the junior classes of secondary schools in the West Indies as well as to the primary schools of these colonies. In view of the encouragement and financial support many of our local Governments are giving to this side of elementary education, a discussion of certain aspects of the subject in these pages may not be out of place, and especially as the subject is one which directly concerns many of our Departments of Agriculture.

From the commencement, the Paper referred to emphasizes the paramount importance of the skill (rather than the knowledge) of the teacher. 'He need not,' it is stated, 'have a specialized training in science; but he should be genuinely interested in the subject of his lessons, and, so far as it goes, his knowledge should be first hand and accurate. It is useless for him to select a subject in which he is entirely dependent on text-books. He should know more than he sets out to teach; but good work has frequently been done by teachers whose knowledge has at first been very limited, but who have not been afraid to learn with, and sometimes from, their pupils.' The Paper then goes on to mention the sources from which the teacher may obtain first hand information. 'Probably the best of all forms of help is obtained by the teacher who is fortunate enough to be in touch with a good local naturalist, and to accompany him on some of his excursions, or to see him at work. He is doubly fortunate if the naturalist himself is, or has been, a teacher of children.' In the West Indies this kind of assistance can frequently be obtained from one of the local agricultural officers, and by periodical visits to the Botanic Gardens and Experiment Stations. In fact co-operation between the Agricultural Departments and the Schools is a well-recognized condition necessary for satisfactory progress.

In framing courses of study it is pointed out that regard should be had to the special circumstances of the school. Many objects of peculiar interest can be profitably studied only in special districts, e.g. in dry localities, or on wet land, or by the sea. In the West Indies such limitations are less than in England, and, on the whole, lack of instructive material or phenomena is the one thing West Indian schools cannot complain of. Some danger exists in many instances where the teacher

tries to arrange a too ambitious or too extensive course. A thorough treatment of a few well defined subjects like Our Bird Visitors, Pond Life, Plant Association in Pastures, is better than an incomplete treatment of many. 'Throughout, the pupils should be encouraged to observe and reason about the subject of study for themselves, and full use should be made of their instinctive curiosity: but it is equally essential that they should have some guidance and advice from the teacher as to what they are to observe. Further the children's observations should have a bearing on one another, and should lead up to some definite result. The later lessons of a course, accordingly, should be made to depend upon the earlier, and there should be constant opportunity for comparison and contrast. Children should be encouraged to make renewed or continued observation of the same thing in different circumstances—i.e., a plant in bud, in flower, in fruit. They should also learn to test and apply their conclusions.'

Continuing, the Paper refers to the subject of expression. 'The child's expressions are the teacher's only guide to its impressions.' Our teaching experience leads us to the belief that the pupil observes things out of all proportion to his capacity for reproducing them intelligently or artistically. The same holds good in after-life. Powers of expression or articulation can be developed in the child by written descriptions; but no words can serve as well as a series of sketches, preferably in colour, due consideration, as well, being given to the question of scale.

In lessons to older children the solution of practical problems may be introduced. Examples of these are the calculation of areas of gardens, the testing of seeds, measurement of root development, recording of observations of temperature and rainfall. These will need the application of arithmetic and graphic mathematics. The employment of graphic methods is to be encouraged.

As regards the management of the class and the provision of equipment, the Paper under review makes one or two pertinent suggestions. 'The class should not always work as a whole. Some of the more advanced pupils can often be appointed, either individually or in small groups, to make independent investigations on well defined lines.' To this might be added the system which originated, it is believed, with the Jesuits, where one child is set to teach another more backward one. In lessons taken out of doors, the class should not waste time in vague observations, but should be set to notice certain definite points, and these classes in order that perfect discipline may be maintained, should not be too large. The bringing to school of specimens by the children is to be encouraged, but unnecessary or wasteful collection should be avoided.

Finally a few suggestions may be quoted concerning books. 'In teaching Nature Study to children the literary and imaginative side is no less educational than the scientific, and should not be neglected. Many of Wordsworth's and Tennyson's poems, the simpler poems of such writers as Mary Howitt, and some passages from Ruskin and Jefferies, combine keen insight into the workings of nature with beauty of expression, and are at the same time sufficiently simple to be appreciated by children. The romance of plant names, the history and legend associated with our trees and flowers, also make a strong appeal to the imagination.' The West Indian teacher will find a special source of material for work on this side of his subject in many of the books written about the West Indies, and in the modern juvenile readers like those reviewed on page 243 in this issue of the *Agricultural News*. Elementary text-books, if used at all, should be employed only with the greatest caution, and serve the purpose of reference rather than systematic study. With young children it is very important to avoid the use of technical terms.

This concludes our review of the main ideas in the Paper, and we think it would be hard to imagine a child of from eight to twelve years of age not progressing under so live a system of instruction. Education authorities in each West Indian colony might with great benefit take notice of this Paper, and place it in the hands of the teachers in the principal schools.

SUGAR INDUSTRY.

MANURIAL VALUE OF FILTER-PRESS CAKE.

Dr. W. E. Cross, Chemist at the Tucumán Agricultural Experiment Station, publishes in the *International Sugar Journal* (June 1915) some interesting analyses and calculations concerning the manurial value of the above-mentioned by-product of the sugar-cane. Basing calculations on the prices of nitrogen and phosphoric acid in tankage, the writer arrives at a value for filter-press cake of about $7.50

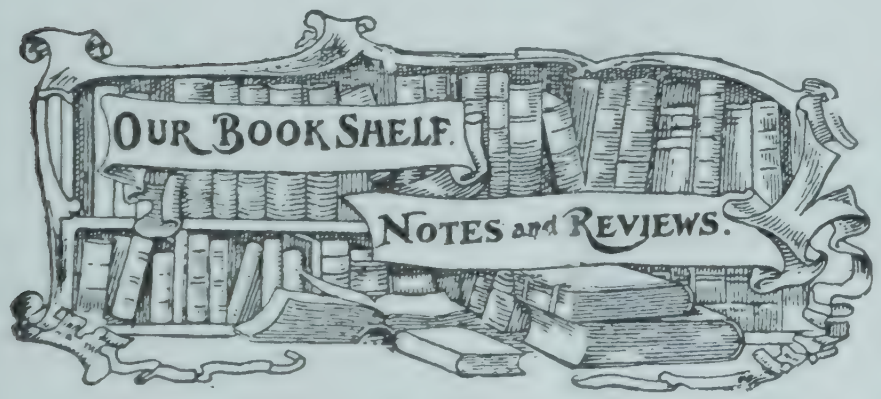
per ton, United States. The following is what Dr. Cross says concerning the composition of the material:—

Before discussing the results in detail, it should be pointed out that the weathering process of drying the cakes resulted in some loss of organic substances (especially sugars) through bacterial action. The drying process usually practised would thus appear to bring about a decrease in the volatile organic matter, and a consequent increase in the ash-content of the cakes. Fortunately, as our results, as well as those of Deerr, would indicate, the loss of nitrogen during the weathering process is not of important dimensions.

The important constituents of the cake from the fertilizer point of view are the nitrogen, phosphorus, lime, and organic matter. The nitrogen content (about 2 per cent. of the dried cake) itself makes the press-cake valuable as a fertilizer. The phosphoric acid is present to a large extent in the citrate-soluble, or 'available' form, and all the cakes examined, but most especially the numbers 1, 4 and 5 from houses where phosphoric acid is used in clarification, are rich in this constituent.

In the lime, too, which is contained in good proportions in all the cakes, we have a valuable fertilizing material for most soils; while the organic matter of which the cakes contain 50 to 70 per cent., is a humus-producing material, whose worth should not be lost sight of.

Altogether, we see that the press-cakes should be a valuable fertilizing material, being rich in the elements most needed by the cane—nitrogen and phosphorus, and in the substances which bring about general soil improvement—lime and organic matter.



TROPICAL READERS FOR SCHOOLS:
(1) The Star of India Readers. Price 4 to 10 annas.
(2) The Rambler Travel Books. Price 9*d.* each.
(3) Rambles among our Industries. Price 9*d.* each.
Blackie and Son Limited, London.

The popularity of Messrs. Blackie and Sons' 'Tropical Reader' (a new one of which is now under preparation) has suggested the desirability of bringing the above series to the notice of West Indian educationists as well. All of these little books are attractively written and illustrated, and not only provide useful elementary information but are also stimulating to the imagination. They might well be employed in the junior forms of our secondary schools as well as in the upper standards of the primary schools.

(1) This series is composed of four books, the last three following in progressive order the simple lessons contained in Book I. The last two are valuable for nature teaching, lessons in botany and other branches of natural history being presented in a pleasant narrative form. Short tales of Indian adventure and romance are also included (together with coloured plates), so that the juvenile pupil falls, as it were, into a baited trap, but doubtless emerges again without realizing it.

(2) For the purpose of this notice we have selected two of these—The British Empire, and Africa, respectively—both concerning tropical conditions. Both books are more than readers; they are descriptive geographies. Each section in these little volumes is composed of an extract from a standard work of travel. We are told about Africa by Livingstone, Sir H. M. Stanley, Sir Samuel Baker, Sir Harry Johnson, Mary Kingsley and others; concerning India we read Sir John Strachey, Sir Edwin Arnold and Sir Frederick Treves; on North America, the writings of A. G. Bradley, Charles Dickens and Cooper Whitney; and so on. It will be unnecessary to state that from these we get glimpses of scenery vividly and accurately described, and an account of the habits and customs of the inhabitants not to be found in formal text-books. It is hoped that the Rambler Travel Books may soon include one on the West Indies. There exists abundant literature on which to base the edition.

(3) 'There was,' says the preface in one of this series, 'a wise custom of the old trade guilds, the "wander-year", when the apprentice, having served his time, spent a year in wandering from one master to another before settling to his trade. The aim of the wander-year was to broaden the knowledge of the young tradesman, and teach him the dignity of his craft.'

A like purpose has led the publishers to issue these books about different modern industries; for it is well that boys and girls, before passing out into the busy life of the world, should learn something of the reality and something of the romance of the great industries by which that life is sustained.

One of these books which will appeal to the West Indies is called Cotton and the Spinner. Its pages trace the history of this staple from its growth in the field till it is ready for the loom. A good deal is said about cotton in the field and there are coloured plates giving some idea of the different species, including Sea Island cotton. The greater part of this little book describes the development of the great Lancashire industry, and in our West Indian schools the perusal of these pages should do much to foster an appreciation of what depends upon the production of raw material in the tropics—in other words, the importance and dignity of tropical agriculture.

Reference is made in the report of the Government Botanical Gardens, Saharanpur, for 1914-15, to a School of Horticulture established at the Gardens, the main object of which is to train a body of young men as overseers for other Gardens. A successful attempt has been made to supplement this Indian training with a course at the Royal Horticultural Society's School at Wisley in Surrey. One student who did this took second place out of sixteen students who sat for the Royal Horticultural Society's general examination for all England.

FRUIT AND FRUIT TREES.

THE LOQUAT.

The Loquat (*Eriobotrya japonica*), Natural Order Rosaceae, is classed as a semi-tropical fruit, its successful culture being confined to regions in which the temperature does not fall below zero. The fruit is something like a small pear in appearance, to which tree the loquat is closely related. A specimen of loquat can be seen in the Botanic Gardens, Dominica. The following is an account of the fruit in regard to its cultivation in California, appearing in Bulletin No. 250 of the University of California Publications:—

Loquat trees have long been grown in California for fruit and ornament, principally in private grounds and public parks. These trees, being seedlings, usually produced inferior fruit. During the last few years improved varieties have been developed here and introduced from other countries. This has stimulated interest and now many commercial orchards are found in the southern part of the State.

Loquats do well wherever the production of lemons is successful. They blossom and set fruit from October to February, and while the blossoms are fairly resistant to cold, the developing fruit is liable to be injured by temperatures much below 30° F.

The loquat tree is not particular as to soil requirements. Although poor soils and a scanty supply of water will produce an abundant crop, and the individual fruits may be of good flavour and quality, they are almost invariably small. Since size is an important factor in a commercial fruit, the fertilization and irrigation of the soil will have to be regulated so as to produce fruit equal to the market demand.

The loquat tree is very prolific and liable to overbear. A common practice in some sections is to crowd the trees into rows 24 feet apart, with the trees 12 feet apart in the row. This helps to dwarf the tree and to produce more uniform and regular crops.

Some of the best varieties have been developed in California. The best variety for an early market is the Early Red, which often ripens in February. The best mid-season varieties are the Champagne, Thales, Advance, and Victor.

More careful methods of grading and packing are advisable. If good markets for the fresh fruit are to be devoloped and good prices received, the grower should ship only uniform fruit of good size and quality. The poorer grades may be utilized for jelly, jam and preserves.

The average price received for the fruit during the past few years has been about 5c. per lb. Budded trees are usually precocious and begin to bear profitably at the age of four or five years. Trees ten years old should produce 200 lb. of marketable fruit.

The loquat tree is remarkably free from serious insect or fungus pests. The pear blight often attacks the flower clusters and twigs in the spring of the year, but is only occasionally fatal to the tree. Birds often destroy quantities of the fruit during the harvesting season. Their depredations may be prevented in small orchards by bagging the clusters of fruit before the colour develops.

Directions for Canning Tomatoes.—Select firm red tomatoes of uniform size, put into tray and lower into boiling water for about one minute to make skins come off easily. Plunge into cold water to make fruit firm and peel promptly. Use a slender pointed knife to cut out the core, being careful not to cut into the seed cells.

All cans and utensils should be thoroughly sterilized by boiling for twenty minutes. Pack tomatoes in can as closely as possible to within $\frac{1}{4}$-inch of the top. Weigh cans, No. 2's should contain not less than 20 oz. and No. 3's not less than 33 oz. of tomatoes.

Mix sugar and salt in the proportion of one-third salt and two-thirds sugar. Put two level teaspoonfuls of this mixture in each No. 3 can of tomatoes and 1 teaspoonful in each No. 2 can. Put the cap on the can, leaving the vent hole open, place cans in tray and lower into boiling water, almost immersing, allowing cans to remain for three minutes to drive out the air. Tip the cans immediately after exhausting and completely immerse in boiling water. No. 2 cans require fifteen to twenty minutes cooking; No. 3 require twenty-two to thirty minutes. Count from the time the water first boils, after immersing the cans, and keep it boiling constantly. Cool as quickly as possible.

If glass jars are used put tops on loosely, set in water nearly to top and boil, pint jars twenty-five minutes and quart jars thirty minutes. The top should be tightened as soon as the jars are removed from the water. Be careful in removing not to place jars in a draft.

In canning with a steam pressure canner, the cans are capped and tipped immediately after filling. Place in canner and process. No. 2 cans require twenty minutes at 228 degrees, 5 lb. pressure; No. 3 cans, twenty-eight minutes at 232 to 235 degrees, 7 lb. pressure. (*Modern Farming*, June 25, 1915.)

Experiment Station, Tortola.—A report has been received from the acting Curator outlining the work done during the quarter ended June 30. The chief work has consisted in the general reaping, cultivating and manuring of the economic plots. As regards individual experiments, an interesting one is the Lima bean plot which is planted with six different varieties, though it is to be regretted that the germination of the seed was rather poor. In regard to ratoon canes it was found that B. 6450 headed the list this year, giving a calculated yield of 19 tons to the acre, which may be considered quite good. An interesting table is contained in the report under review showing the first year's results of the lime tree manurial experiments. From this it appears that increased returns may be expected to follow the application of quick-acting nitrogen; but caution must be exercised in drawing deductions too soon.

The third coco-nut demonstration plot is soon to be established in Tortola; this plot will occupy 6 or 7 acres. Nos. 1 and 2 are in a fine healthy condition, and the demonstration so far has given every satisfaction. Mention was made a short time ago in this journal of the proposed cotton-seed farm extension. The cultivating and clearing of the new land has formed part of the work during the quarter under review. As regards the cotton industry, it is stated that the cotton factory has continued to purchase seed-cotton but it is believed that next year part of the cotton area will be planted in food crops, in view of the high values for these products which ranged during the last three months of 1914.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. From information sent by Mr. J. C. Moore (Superintendent of Agriculture), good progress has been made during the last few months in the nursery section of the Botanic Gardens. Thousands of well-grown lime plants, and about 14,000 coco-nut plants are now ready for distribution, and a large number of mango and orange stock for budding work are developing in a satisfactory manner. It is stated that there is likely to be an increased demand in Grenada for grafted and budded plants of good varieties of oranges and mangoes, and efforts are being made to meet this demand. Several new plants have been introduced into the colony recently, including Robusta coffee seeds, and *Ixora macrothyrsa*, a decorative plant from St. Lucia.

As regards the experiment plots, it is recorded that continuity has been partly broken in the manurial trials owing to the impossibility of procuring potash. It has also been necessary to substitute cotton seed meal for dried blood, as enquiries for the latter have been unsuccessful. In connexion with demonstration plots, mention is made of the kind co-operation of Mr. C. P. Thomas of Carriacou, who has placed an acre of land free of charge at the disposal of the Department for the purpose of growing corn, peas, beans, yams, etc., with the object of trying to encourage the better cultivation of these crops by the peasantry at Carriacou. Work has been started on the plot, and the Department is fortunate in having the assistance of Mr. Thomas in supervising it.

ST. VINCENT. There has been considerable activity, writes Mr. W. N. Sands, on estates and lands of small owners in connexion with the preparation and planting of cotton, corn, coco-nuts, beans and peas. The export of stock, especially to St. Lucia, increased considerably and a good market was found. All indications point to the fact that the Colony's crops during the coming season will be more diversified than in recent years. During June, the agricultural staff found it necessary to devote considerable time to investigations in regard to pests and diseases of corn and beans. There were several outbreaks, but in some cases these were not severe.

ST. LUCIA. With a view to increasing the number of visits to the Botanic Gardens, the Department in this island is taking the necessary measures to construct two new driving entrances. On the estates the following observations are recorded relating to staple crops in June: cacao was flowering but somewhat late in certain localities; the lime crop was just coming in while the reaping of sugar had finished. The lime juice factory opened on May 29 and one cask of concentrated juice was made during June. The Agricultural Superintendent, Mr. A. J. Brooks, has made several visits during the month, including one in connexion with the corn ear worm, and the second to the school at Laborie for the purpose of stimulating garden work. The rainfall during the month at the Botanic Station at Castries was 21·15 inches, while at Réunion it was only 8·42 inches. During the month 9,550 lime plants were distributed.

DOMINICA. Mr. Joseph Jones in a recent communication states that heavy shipments of green limes were made during June to New York, amounting to 6,621 barrels. The local price paid for green limes was 12*s.* per barrel, which dropped to 8*s.* when the month closed. The price paid for yellow limes advanced to 10*s.* per barrel, and for raw juice to 1*s.* 4*d.* per gallon. The cable quotation for concentrated lime juice at the end of the month was £21 per pipe. Educational and investigation work has been carried on during the month. The former has included the half-yearly examination of the pupils, the latter the conduct of investigations concerning lime root diseases. The plants distributed at the end of the month are given as follows: limes 10,955; cacao 500; budded citrus, 107; grafted mangoes, 19; shade trees, 160; miscellaneous, 33: Total, 11,774.

MONTSERRAT. There appears to be an interesting variety of crops under trial at the experiment station at the present moment. Mr. Robson, the Curator, says the plot of pine-apples promises to give interesting results, and that both local and imported varieties of Lima beans are promising. Furthermore it is stated that the fleshy-podded and white velvet bean appear as vigorous as the Bengal beans. The weather has been satisfactory for planting cotton, but some trouble has been caused by the cotton worm, partly perhaps because it has appeared exceptionally early this year. During the month of June, 20 crates of pine-apples were shipped for trial to Canada. These are stated to have been excellent examples of the Montserrat pine. The rainfall at the Botanic Station was 4·43 inches; high winds prevailed during the latter half of the month.

ANTIGUA. The general routine work carried on at the stations, and at the gardens, occupied the greater part of the Curator's time during June. It is mentioned that the granary was working during the month and that a lecture was given to students by the Curator. In the fields the young cane crops continued to look promising, and in a number of cases nursery beds have been prepared on estates for onion seed. This is a point of some importance, for they have seldom or never been prepared so early in previous years. In regard to Indian corn it should be mentioned that the plot at Fitches Creek estate was reaped, but the yield obtained was poor.

ST. KITTS. The Central Sugar Factory ceased grinding on June 19 with an output of about 6,100 tons of sugar. This represents the crop from about two-thirds the acreage of the island. The young cane for next year's crop has much improved. With a continuance of present weather the prospects for next season are very promising. Mr. F. R. Shepherd, who is responsible for these observations, further mentions that the young cotton is all that can be desired, the growth being remarkably uniform and vigorous, with a conspicuous absence of rogues or weak plants. The entire crop has been planted from local seed, none having been imported. Although worms when they have occurred have been easily controlled, some damage has been done to the young cotton on one estate by cockroaches, but the use of poison bait will doubtless keep this pest under control. The poison bait at present being tried consists of Paris green, cotton seed meal and molasses.

NEVIS. The young canes throughout the island during June suffered very much from want of rain, and in some places they are badly damaged. In spite of the dry weather, which is exceptional in the islands this year, the young cotton in some places looks well and will doubtless improve. Provision crops throughout the island are doing fairly well but they are reported to be in want of rain. Much of the work at the experiment station concerned the production of planting material: for instance, during the month 1,000 sweet potato cuttings, 1 lb. of Lima beans, and 223 lb. of selected cotton seed were distributed. The rainfall for the month was 2·52 inches, which is very low compared with that received in the other islands

COTTON.

WEST INDIAN COTTON.

The report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ended July 3, is as follows:—

During the month of June the market has remained very quiet with only a limited demand. A few Planters' crops have been sold, also a lot of 120 bales repacked cotton reclaimed from a fire last spring. The buying was on account of the Northern mills.

The unsold stock consists entirely of Planters' crops, which are firmly held at 25c. to 30c., for which there is little demand.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool and Manchester, up to July 3, 1915, were 103 and 1,819 bales, respectively.

The Board of Trade Journal gives the following statistics on cotton imports and exports under dates June 17 and 24, respectively:—

The number of bales of cotton imported into the United Kingdom during the week ended June 10, 1915, was 116,255 (including 71 bales British West Indian, 6 bales British West African), and the number imported during the twenty-three weeks ended June 10, 1915, was 3,463,140 (including 2,128 bales British West Indian, 498 bales British West African, 8,301 bales British East African, and 435 bales foreign East African). The number of bales exported during the week ended June 10, 1915, was 15,754, and during the twenty-three weeks 344,379.

The number of bales of cotton imported into the United Kingdom during the week ended June 17, 1915, was 105,173 (including 3,199 bales British East African and 487 bales foreign East African), and the number imported during the twenty-four weeks ended June 17, 1915, was 3,568,313 (including 2,128 bales British West Indian, 498 bales British West African, 11,500 bales British East African, and 922 bales foreign East African). The number of bales exported during the week ended June 17, 1915, was 7,924, and during the twenty-four weeks 352,303.

WILD RUBBER AND SELECTION.

Dr. Cramer of Buitenzorg, in a paper under this title,* gives some useful hints to growers on the selection of Hevea. This subject, he points out, has been neglected, or at any rate undertaken on wrong lines. The selection of Hevea should commence with the seed-bearers, and not be entirely confined to the seeds or the seedlings. According to the author's personal observations of both wild and cultivated trees, considerable variation occurs in the shape and size of the seeds from different examples, and also in the productiveness of wild trees, among which 'barren' individuals are sometimes found. Dr. Cramer gives reproductions of photographs of a series of seeds from trees of *H. brasiliensis* growing in the same localities in Brazil, which show striking variation in size. The impossibility of determining critical species from seeds alone is evident from the author's remark that 'the difference in [seed] characters in *Hevea Randiana* (a closely allied species), and *H. brasiliensis* is less marked than may occur between the seeds of two trees of true *brasiliensis*.'

The wild trees observed by Dr. Cramer were all from the lower reaches of Brazilian rivers, which often overflow their banks at high tide, and he suggests an interesting explanation of the cause of marked differences which are shown in adjacent trees in such localities. Frequently seeds may be observed floating down the rivers from the upper reaches, and these become stranded in quiet corners of the banks, where they form a layer on the water. At high tide they are immediately transferred to a considerable distance on the adjoining banks, where they germinate. Therefore many of the trees now growing in the lower reaches of Brazilian rivers are really the direct offspring of upper region types, and thus a mixture of the two races has been brought about.

Part 5 of the paper deals with experiments on seedlings, and tables and photographs are given showing their relative variation from different stocks.

In part 6, Dr. Cramer points out that, according to the late Dr. Huber, the Tapajoz region of Brazil where Wickham obtained his seeds, is not the place from which the best rubber is at present obtained, and as nearly the whole of the East India plantations have been stocked from seeds gathered in this region, it is therefore assumed that the quality of the rubber is not so good as it might have been had the first seeds been gathered in the Acré district of the up-river regions, i.e., on the Beni and other tributaries of the Upper Madeira and Purus rivers, where the best rubber is at present obtained. There is, however, no indication that this rubber is superior to that which used formerly to be collected in the Tapajoz region.

The question is discussed as to whether this Acré or up-river Hevea may be a distinct variety or sub-species of *H. brasiliensis*, as is the general belief in Brazil, and Dr. Cramer is himself inclined to this opinion.

It should be noted that Dr. Cramer's work on Hevea selection so far concerns the character of the seedlings only, and it remains to be seen whether the young plants showing the most vigorous growth will prove to give the greatest yield of latex.

Dr. Cramer's interesting contribution concludes with notes on the practical importance of careful choice of the best producing varieties of other agricultural crops, citing as examples the advantages which have accrued from the introduction of *Cinchona Ledgeriana*, with a bark richer in quinine than the older *C. officinalis*; the replacement by Assam instead of the old China tea, and the revival of the coffee cultivation in Java by the advent of *Coffea robusta*. (*Kew Bulletin*, No. 4, 1915).

*International Rubber-Congress Met Tentoon Stelling. Batavia, 1914, Rubber recusil.

UNION OF SOUTH AFRICA: REPORT ON THE DEPARTMENT OF AGRICULTURE FOR 1913-14. *Government Printers*, Capetown. Price 7*s.* 6*d.*

From an agricultural point of view, South Africa is essentially a stock-raising country, as can be seen by an examination of the values and quantities of the chief exports. For example, taking the 1913 figures, it will be found that the total of the principal agricultural exports amounted in value to £12,245,580, of which £5,719,288 represented wool, £2,953,587 ostrich feathers, £2,017,863 hides and skins, and £876,255 Angora hair. The balance is made up principally of bark, maize, tobacco, wine and sugar; but it will be realized that these products have not yet assumed positions of importance comparable with those occupied by the products of live-stock.

In such circumstances it is to be expected that the Union Department of Agriculture would accord to the betterment of live-stock and to veterinary research a premier position in its operations. Perusal of the report under review will make it clear that it is so. Of the £467,018 expended on the agricultural department during 1913-14, no less than £290,000 was allotted to the veterinary and other live-stock divisions.

Turning to the Secretary for Agriculture's remarks on the work of this veterinary division, it is stated that while maladies like glanders, epizootic lymphangitis, mange and swine fever have in years gone by occasioned very large losses, they have now been reduced to very small dimensions, so the result of the work has been satisfactory. As in other countries, difficulties continue in regard to the eradication of tuberculosis, but it is hoped in the near future to conduct a campaign against this at a moderate cost, and with reasonable hope of success. As regards the relations existing between the veterinary division and the farmers, it is stated by the Secretary that there is a growing demand for veterinary officers, which is a pleasing testimonial to the value of the services rendered by the officers of the Division, and it proves one of the illustrations that could be given of the great change that is taking place in the ideas and circumstances of the farmers, many of whom, a short time ago, regarded veterinary surgeons with disdain if not with aversion.

A special section is devoted in the report to sheep, but owing to the unimportance of this class of stock in the West Indies reference in any detail is unnecessary in this review. It may be noted, however, in the following section dealing with the division of veterinary research, that in connexion with inoculation against a certain disease, the high mortality observed after inoculation was probably the result of the infection of the animals by a second disease transmitted in the serum. This idea of accidental infection is worth bearing in mind in connexion with inoculation in general.

In the South African department, plant industry is represented by five divisions, namely, botany, tobacco, cotton, horticulture, and viticulture. On account of the importance of live-stock, economic botany is concerned largely with the production of fodder, maize and other feeding stuffs. It is noticed in the section dealing with the Division of Botany, that Mr. J. Burtt-Davy, Chief of the Division and author of the well-known work on maize has resigned in order to engage in the breeding of plant seeds on his own account. Following this resignation the Division of Botany, Plant Pathology and Mycology were united and placed under Mr. Pole Evans. In connexion with the work on tobacco and cotton, the selection and sale of reliable seed to farmers has been continued and has done much to prevent disappointment in germination, and to promote uniformity of crop and trueness to type. With special reference to cotton the view is held that the establishment of this industry will constitute a safeguard against the collapse or partial collapse of the tobacco industry which, from the report under review, appears to be in some danger. Whether this be so or not, it is certain that the seed derived from cotton would afford valuable nitrogenous food for cattle, which is greatly needed in a country where live-stock constitutes the principal industry.

The information relating to horticulture concerns citrus cultivation, especially oranges and pine-apple growing, and the production of apples. The oranges exported from the Union in 1913 were valued at £11,530 compared with £6,345 in 1912; and the export of pine-apples in 1913 was valued at £1,687 compared with £1,244 in 1912.

The remainder of the report of the Secretary of Agriculture reviews the work of the Division of Entomology, Chemistry, Publications, Dry-farming, Division of Fencing, etc. In connexion with the last named division, a new Fencing Act renders it obligatory for adjoining owners to share the cost of boundary fences in certain districts. It also gives power to the Minister of Agriculture to compel the erection of fences for the prevention of the spread of disease. The law at present gives the Department the right to fence on behalf of owners, but this right is exercised with reluctance, since it is found that the construction can be carried out more cheaply by the farmers themselves, who have their own labour and means of transport, than by the Department, which has to make special arrangements.

Readers of this review who require more detailed information on the matters here dealt with merely in outline, should refer to the publication itself in which will be found, following that of the Secretary, detailed reports by the heads of the different divisions. Some of these, for instance, entomology and mycology, have not been mentioned in this review, but may receive attention in this journal in a future issue.

An interesting case of early maturity, or rather, early flowering, is referred to in the *Journal of Heredity* for July 1915. The Florida velvet bean has long been grown in Georgia usually from Florida seed, since it often fails to ripen seed farther north. Several farmers in Georgia, however, have found an earlier strain in their fields, and this strain is now extensively grown there. These Georgia 'mutations' ripen two months earlier than the Florida and are as early as the Yokohama beans. From crosses between the Yokohama and the Florida, it is concluded that the Florida has a factor for late flowering, H, which the Yokohama does not possess. Hence it may be supposed that the Georgia velvet arose from the Florida velvet by the spontaneous loss of the factor H.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture' Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the art of nature teaching, and consists of a review of a publication which contains many suggestive ideas that should prove stimulating and useful in the West Indies.

In connexion with the above, attention should be given to the review of tropical readers on page 243.

Items of local agricultural interest will be found on page 245.

A suggestive article on the planting of teak on waste lands appears on page 253.

Insect Notes and Fungus Notes deal with the pink boll worm of cotton, and a new form of black root disease on cacao, respectively.

West Indies in Canada, 1915.

This year's edition of the illustrated handbook having the above title has just been issued by this Department and forwarded to Canada for distribution at the National Exhibition which opens at Toronto towards the end of August. The figures relating to trade between the West Indies and Canada have been brought up to date and include a detailed statement for the year ending March 25, 1915. The section describing West Indian products has been carefully revised, and in this and other sectons of the publication many new illustrations have been introduced. As in former years the advertisement section continues to be an important feature It is worth noting that since none of the colonies with the exception of Jamaica are exhibiting, the present publication is practically the only West Indian medium these colonies have this year, for bringing their wants before the Canadian public.

One of the objects of the handbook is to encourage the visits of Canadian tourists and men of business. It is hoped that, in spite of the disturbed conditions, next season may see a goodly number of such visitors in these islands.

Eradication of Weeds.

The *Experiment Station Record* for February 1915 refers to a paper dealing with observations on the eradication of weeds by the use of kainit, in which are described twelve experiments with several kinds of weeds growing with cereals and treated with varying amounts of kainit. The author concludes that kainit is a serviceable weed killer when used under certain favourable conditions. The first requirement is the application of a sufficient quantity, not less than 1,200 kg. per hectare (1,068 lb. per acre), and increasing with the age of the weed to a probable maximum application of 2,000 kg. The application must be made on heavy dew or rain-dampened plants; the best results follow use on a dry day. Foggy or misty weather after the application retards the action of the kainit and will make the results doubtful. In the experiments, the action of kainit was especially favoured by dry or slightly frozen ground, which conditions seemed to retard the flow of water to the plants to relieve the plasmolytic action of the kainit. The use of finely ground kainit evenly distributed greatly favoured its action. The weeds must not be old, and the younger, the better were the results.

All kinds of weeds were not equally acted upon by the kainit. A heavy application of kainit had an injurious effect upon the texture of the soil surface except in the presence of lime. The potash in the kainit served for remaining plants or future crops. Cereals were only temporarily injured by the applications. Barley seems the most easily affected, but soon recovered even with an application of 2,500 kg. per hectare.

The author discusses at some length the action of the various compounds in killing weeds. Carnallit was more effective than sylvanit.

Extraction of Tannin from Wattle Bark.

Reference is made in *The Board of Trade Journal* for June 10, 1915, to the erection of a wattle extract factory at Merebank, Natal, for dealing with the wattle bark on a new system, in which experiments have been carried out for some time past. This new process for extracting tannin from green wattle bark consists in subjecting the bark to a series of mechanical pressings by means of heavy bronze rollers, and applying hot water and tanned liquor washes to the pressed bark between each set of rollers. The extraction is effected within a period of two minutes, and no darkening colour is possible as occurs in the process of leaching in pits.

It might be added that, according to the report for 1914 of the Durban Chamber of Commerce, the Natal wattle bark trade has suffered a check by reason of the war. The exports for the first seven months of 1914 amounted to 47,663 tons, as compared with 39,899 tons in the corresponding period of the previous year; but the total amount exported in 1914 was only 58,132 tons, valued at £286,399, as compared with 65,042 tons, valued at £309,268, in 1913. Had conditions been normal, it is stated, the exports for 1914 would have exceeded those of 1913.

Classification of Sweet Potatoes.

In the Sweet Potato Number of *The Philippine Agriculturist and Forester*, Vol. III, No. 6, there is given in a paper by Apolonis Ramos Mañoz on the identification and tests of varieties of sweet potatoes, a Key devised by Dr. Groth for the classification of varieties of sweet potato, which should prove of considerable value in the work of selecting desirable varieties for propagation. The system of classification here is based on the character and habit of the varieties, that is to say—(a) shape of the leaf, (b) size of the leaf, (c) length of stem, (d) colour of stem, (e) size of stem, (f) presence of star, (g) colour of lower surface of veins, (h) arrangement of hair on upper surface of leaf, (i) outside colour of tubers, (j) colour of the flesh of the tubers, (k) distinctness of wood elements in tubers, and (l) flowering habit. As will be seen on reference to the *West Indian Bulletin*, Vol. XII, p. 521, this classification differs somewhat from that adopted by Mr. W. Robson, Curator of the Botanic Station, Montserrat, in his attempt to classify the varieties of sweet potatoes then in cultivation at the Montserrat Experiment Station. Mr. Robson's system, which was that originally adopted by R. A. Price, horticulturist of the Texas Experiment Station in 1893, divided sweet potatoes into three groups having (a) split or lobed foliage, (b) shouldered or slightly lobed foliage, and (c) round or entire foliage.

The author of the paper under consideration, whilst adopting Dr. Groth's key and classification in preference to Mr. Robson's, emphasizes the fact that different varieties of sweet potato have different ability to yield, and have different taste as well as colour; that there are extra early, early, somewhat early, late and very late varieties; that some are easily affected by drought and some are quite resistant; that some are susceptible to disease, and others almost free from disease; and that, unless irrigation is feasible, level culture should be employed during dry seasons, and the ridge culture otherwise.

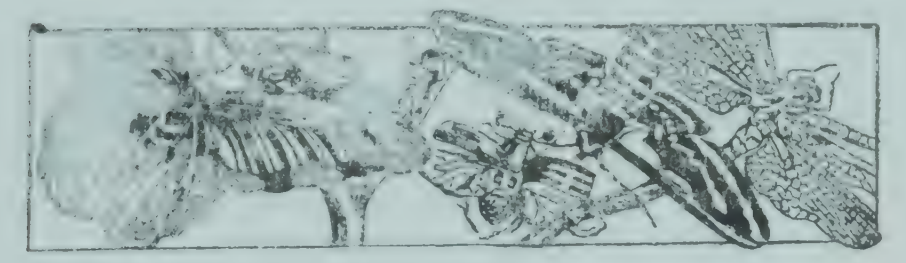
In reference to this last suggestion as to the conditions under which level culture or ridge culture should be employed, the paper contains a summary of conclusions arrived at from experiments in ridge and level cultures, which should receive attention in the West Indies.

Bullock Creeping Grip Tractor.

This is the name of a new small tractor machine, which it is said more nearly reaches the needs of the modern sugar planter than any previously seen. The *Louisiana Planter* for June 19, 1915, gives particulars of this machine and the results of a demonstration that was made recently at Audubon Park in combination with two mould board ploughs cutting 12-inch furrows. These ploughs were of the sulky style, and were gauged and guided by one man, while the tractor was managed by another man. The demonstration is said to have been wonderfully successful, and would seem to show that the inventors have finally got their tractors down to a usable size that will quickly lead to their general use in sugar-cane countries.

A very notable feature of this tractor is said to be the short circle in which it can turn: it can turn in less land than is ordinarily required for the four-mule team, and turns more easily than some heavy two-mule teams. It was demonstrated that the turn could be on a very narrow headland. The creepers are 6 feet in length, and the turn around completely was made with the ploughs hitched to the creeper in a circle 8 feet in diameter. This seems almost impossible, but these tractors are so built that their 6-foot wheel base is all in contact with the ground under pressure, that portion between the two axles being forced down to the ground by a patented spring device so that the whole wheel base utilizes every corrugation of its wide belt chain. The motor is so adjusted also, that the wheels on one side can be turned in one direction, and those on the other side in the reverse direction and the whole machine move around as though swung on a pivot, thus succeeding in a way, says the journal, that we have never seen done so successfully before.

The machine, it may be added, weighs 2½ short tons; several of them are already in use on Louisiana plantations; the builders are making five sizes and are offering to supply the machines at less prices than would be the cost of the mules doing the same work. Those interested are advised to consult the builders (N. J. Doud, Southern Distributor, 314 Hennen Building, New Orleans), as these machines have already demonstrated their effectiveness and no longer remain an experiment.



INSECT NOTES.

THE PINK BOLL WORM.

(GELECHIA GOSSYPIELLA, SAUNDERS.)

In a recent number of the *Agricultural News* (page 186 of this volume) attention was directed to the pink boll worm of cotton as a pest which has proved to be most serious wherever it has occurred, and which would in all probability prove to be equally serious if it should occur in the West Indies. For the sake of emphasizing the importance of this insect as a cotton pest, the present, more extended account has been prepared.

A circular issued by the United States Department of Agriculture entitled The Pink Boll Worm has recently been received. This gives a good account of the insect and of its origin, food plants, distribution, etc., and since it presents in convenient form a summary of the essential facts, it has been largely drawn on in the preparation of these notes.

DISTRIBUTION.

For several years the pink boll worm has been reported as attacking cotton in different countries. In 1906, Maxwell Lefroy published in his *Indian Insect Pests* the distribution of the pink boll worm as known at that time: it was India, Ceylon, Burmah, and the Straits Settlements. Three years later (1909) *Indian Insect Life* by the same author appeared. In this work the pink boll worm was rec rded from East Africa in addition to the previous known localities. In the Circular of the U. S. Department of Agriculture mentioned above, the distribution of this insect in 1914 is given as follows: 'The pink boll worm was described originally from India in 1843. Since that time it has been found more or less generally widely spread in India, Ceylon, Burmah, Straits Settlements, Egypt, British East Africa, German East Africa, Nigeria, Sierra Leone, and the Hawaiian Islands. In the Hawaiian Islands it was undoubtedly introduced in cotton seed from India. There is also a doubtful record of the occurrence of the species in Japan.'

HOW THE INSECT SPREADS.

The moth, which is the adult form of the pink boll worm, is a small fragile insect which cannot fly far. If this were the only way or even the ordinary way in which the insect spread from place to place, it would be able to disperse only very slowly. It is, however, in the immature stages that the spread of the pink boll worm can be accomplished. The larvae live inside the cotton seed in the growing bolls, in seed in old dried bolls, and in seed in bulk shipped for planting or oil extraction. It will be seen from this that the shipment of cotton seed is the means by which the pink boll worm is introduced into one country from another, and when it is known that the records show that in Egypt, in one instance at least, a pink boll worm (the caterpillar or worm itself) has lived for seven months, it will be seen how great the danger is.

The pink boll worm may also be transported in baled cotton. Cotton seeds get into the ginned lint either by the seed passing around the end of the rollers in the gin, or occasionally between the roller and the knife; and in one instance at least a living pink boll worm has been found in a cotton seed inside the bale of cotton when this has reached its destination at the factory where the cotton was to be spun.

LIFE-HISTORY.

The eggs of the moth of the pink boll worm, which hatch in about ten days, are deposited singly on various parts of the cotton plant. The larvae, which are very small when first hatched, feed for a short time on the leaf surface, but soon penetrate to the interior of the cotton bolls.

The larval stage lasts about twenty days, at the end of which time the full-grown worm is about $\frac{1}{2}$-inch long, and somewhat pinkish in colour. It is in the larval stage that the insect injures the cotton by feeding upon the seeds. The pupa is often formed inside the hull or shell of the seed from which the larva has eaten out all the interior.

The pupa stage lasts about fourteen days, after which the insect becomes a moth. The moth of the pink boll worm is about $\frac{3}{4}$-inch in expanse, the colour being of a general greyish brown with darker blotches. In this stage the insect lives ten days or longer, probably longer as a rule. Egg-laying begins about three or four days after the moth emerges.

The figures representing the length of the several stages are then, as follows:—

Egg	10 days	
Larva	20 ,,	(to 7 months)
Pupa	14 ,,	
Moth	10 ,,	
Total	54 days	

As it is in the larval stage that injury is done to the cotton and that the insect is most likely to be introduced into new localities, so also is it that in the larval stage the greatest variation in duration occurs. As already mentioned, it has been shown in Egypt that it is possible for the larva, that is the pink boll worm itself, to live for seven months in the cotton seed. This time is sufficient for the transportation of cotton seed to the most remote parts of the world.

FOOD PLANTS.

All varieties of cotton are attacked by the pink boll worm, from the highly specialized Sea Island types to the hardiest of native varieties in all countries where the pest occurs. In the Hawaiian Islands this insect has been reared from *Thespesia populnea*, which is known in the West Indies as Mahoe or Anodyne. In Egypt it has attacked Til (probably *Sesamum indicum*), and pomegranates.

The fact that plants differing in their nature so much as these should be attacked, indicates that once established the pink boll worm would continue to subsist so long as plants with oily seeds, not too well protected from attack, occurred even in the absence of cotton and other favoured foods.

INJURY TO COTTON.

The pink boll worm injures cotton by causing a loss of many bolls, and by spoiling much cotton in the bolls that remain on the plant.

In cases of heavy infestation, fully 50 per cent. of the crop may be lost by the dropping of young bolls which are injured by the feeding of the caterpillar.

In addition to this, there is the loss due to the injury in those bolls which persist and open on the plant. In these only one locule may be infested. The fibre and seed in this locule are almost certain to be spoiled, and the injury affects the whole boll so that the cotton in the uninfested locule is of inferior quality. Staining of the fibre also results from the attacks of this insect.

It would seem that the pink boll worm has been introduced into many new localities with, or in, cotton seed for planting. Examples of this are probably to be found in the Hawaiian Islands, in Egypt, and the several colonies in Africa where it is now well established. It has not yet been introduced into the United States, but in 1912 a shipment of 500 lb. of Egyptian cotton seed got as far as Arizona, where it was discovered to be infested by pink boll worm, and the whole shipment was destroyed by fire. Since then on several occasions the pink boll worm has been intercepted in shipments of cotton seed in the United States.

'On July 1, 1913, the Federal (U.S.) Horticultural Board promulgated a quarantine against cotton seed from all foreign countries, with the object of preventing the invasion of the pink boll worm. Since this quarantine has been in effect, several shipments of cotton seed have been intercepted. All were found to be infested by the pink boll worm; one shipment which was to be forwarded to Arizona, showed an infestation of 20 per cent.

'In this connexion it may be stated that there is no longer any need for importing cotton seed from Egypt, since there is an ample supply of well-selected and acclimatized seed available in Arizona.'

The quotation cited above refers to cotton seed imported for planting, in connexion with the attempts that are being made to establish the cultivation of long staple cotton. It is most important to note, that all shipments of seed intercepted were infested with the pink boll worm.

Each cotton-growing island in the West Indies at present has a well developed strain of fine cotton, and on this account importation of seed for planting is unnecessary. If, for any reason, the crop of one island should fail to produce a sufficient amount of good seed for the next season's planting, it can be obtained from another island where the conditions are similar, the cotton from which would require but little acclimatizing. Cotton seed is imported to some extent into at least one island (Barbados) for oil extraction, and this would constitute a menace to the cotton-growing industry of that and all other islands of the Lesser Antilles, if seed should be imported from any country where the pink boll worm exists.

In determining what precautions should be adopted in the West Indies against the introduction of the pink boll worm, the following should be considered:—

(a) The pink boll worm would undoubtedly prove as destructive in the West Indies to the cotton industry as any pest has ever been to cotton in any country, which is equal to saying that the pink boll worm would most likely put an end to the cotton industry in any West Indian colony where it becomes established.

(b) At the present time the West Indies, the United States, Central and South America are among the few cotton-growing localities where the pink boll worm is not yet known to exist.

(c) Localities not now known to be infested with the pink boll worm may become so at any time, and cotton seed sent out from them may then easily carry the pest.

In these circumstances, it would seem that those islands in which a cotton-growing industry exists ought to put a total prohibition on the importation of all cotton seed, except when small quantities are desired for experimental planting, and such seed should be admitted only if it comes from a locality known or certified to be free from pink boll worm, and on condition that the seed passes directly into the custody of the Agricultural Officers by whom it may be properly treated and, if necessary, destroyed.

H. A. B.

INDIAN TOBACCO.

A bulletin just issued by the Agricultural Research Institute, at Pusa, by Mr. and Mrs. Howard, who have done much valuable economic botanical work in India, recalls the strides that in recent years have been made in the improvement of tobacco cultivation in India, particularly in Bihar. There are none in India now who remember the Chinsurah cheroot, the manufacture of which, apparently, languished after the Dutch disappeared from India; but if it was made from the crude Indian tobacco, it could not have been a very delectable weed. There may be some, though, who remember the attempt of a Calcutta firm who, about thirty years ago, tried to introduce at Pusa the manufacture of pipe tobacco from indigenous leaf. The best that can be said of the result is that, as a smoke, it left much to be desired, and attempts to popularise it in Calcutta failed. Since then we have heard of more than one attempt to grow and cure a tobacco in India, both in Bihar and South India, that will take the place of the American tobacco that forms so large a part of the cigarette and pipe tobacco imported into this country. . . . . In 1910 or thereabouts, several of the tobacco factories came into existence, and cigarettes made from Indian tobacco began to find their way into the market. The best known of these is the Peninsular Tobacco Co., with factories at Monghyr, Bangalore, and other places. Having the huge and wealthy Trust, the Imperial Tobacco Co., behind it, the Peninsular Tobacco Co. has been able not only to undertake the manufacture of cigarettes on a gigantic scale, but to experiment on its own account, and to co-operate with the Department of Agriculture in trying to secure a tobacco of fixed and uniform grade suitable for the making of cigarettes. The Bulletin under notice, and a previous one by the same authors, are largely an account of these experiments. After many discouragements and in the midst of many difficulties of cultivation and curing, it has been possible to secure what was desired. A type of Indian leaf has been discovered which has the light colour, the fine texture, and the necessary elasticity when cut to make good fillings for cigarettes, and the flavour and aroma are said to be fair. In making these experiments imported varieties of American tobacco did not, under the altered conditions, reproduce the qualities desired, and the Indian varieties gave more promising results.

The main reason for this was that the American varieties were not quick growers, an imperative necessity in Bihar, where the tobacco must be planted and cut in a few months towards the end of the year. In securing a tobacco of sufficiently high grade for the manufacture of cigarettes, it goes without saying that promising results have been secured in the improvement of other varieties of tobacco, which was a consummation much to be desired, because we are reminded that from an economic point of view there are obvious drawbacks to the production of a high grade cigarette tobacco only. The only customer in Bihar for this tobacco is the Peninsular Tobacco Co., as the local dealers do not require this product. (*Journal of the Royal Society of Arts*, June 11, 1915.)

GLEANINGS.

The St. Lucia *Gazette* for July 3, 1915, publishes the text of a bill for an Ordinance for the registration, encouragement and assistance of Agricultural Credit Societies in that Colony under the Raiffeisen system.

According to the *Mirror* of Trinidad (June 28, 1915), very dry weather has been experienced in Tobago recently. In many places young corn cultivations have been destroyed. Planters say that unless rain comes quickly, their crops will be completely ruined.

Interesting observations appear in *Modern Cuba* for May, concerning tropical fruits in Florida. Speaking of avocado pears, it is mentioned that the Trapp variety is still the only one that is planted to any extent. The thick-skinned Guatemalan type is grown to a limited extent for the late market. Mangoes are undergoing investigation. It now appears that many of the best varieties of this fruit bear only male or staminate flowers.

The following figures quoted by Mr. G. W. Freeman, Assistant Director of Agriculture, at a recent meeting of the Board of Agriculture, Trinidad, give the result of recent developments of the tobacco industry in Tobago: In 1912-13 the weight of leaf tobacco was 1,842 lb., valued at £92 2*s.*; in 1913-14 it was 20,303 lb., valued at £1,263; and last year 52,183 lb., valued at £3,262. Tobacco planting is said to be very popular among the proprietors in Tobago.

A note in the London *Chamber of Commerce Journal* for June 19[illegible], deals with ipecacuanha from Brazil. In the year 1910, 42,368lb. was exported which gradually rose to 75,078lb. in 1914. This plant, which is well known in the West Indies, contains in its root a valuable drug which has several uses in medicine. Ipecacuanha is a constituent of wine of ipecacuanha and of Dover's powder, and is now regarded as a specific in certain forms of dysentery.

According to the *Planters' Chronicle*, great changes are in contemplation as regards the extension of the United Planters' Association of Southern India. It is proposed to establish new rubber, tea and coffee stations, and to employ the services of a mycologist. It is unlikely, however, that the necessary funds will be available under the existing disturbed condition of affairs, and action may be deferred. The same journal, from which the above is taken, contains an interesting account of the history of the Association since its formation.

Information has been received from the acting Commissioner of the Virgin Islands to the effect that the onion industry in Tortola is progressing favourably. To the various markets during the early months of the year, 43 crates were shipped, weighing 2,399 lb., and providing a profit after sale of nearly £15. Although it is realized that this is only a small beginning, it is believed that with the proper encouragement the industry is now receiving, a bigger production may be effected next season. It should be added that this industry has been brought before the peasantry, who have realized its possibilities.

Mention is made in the last two issues of *Tropical Life* of the new book on Brazil by Mr. Woodroffe, entitled, The Rubber Industry of the Amazon and How Its Supremacy can be Maintained. We understand the book touches on matters other than rubber of considerable interest to the West Indies. The book will consist of 400 demi-octavo text pages, with some sixty more for introduction, synopsis, index, etc., making about 500 in all, as it will be illustrated by forty-eight plates on art paper. It will be printed on good quality paper, and published by *Tropical Life* at 21*s.* net.

In the Barbados *Official Gazette* for July 8 instant, there is published a Regulation made by the General Board of Health under the provisions of the Public Health Act, 1908-9, prohibiting the landing in that Colony of horses, mules, or asses arriving from the island of Barbuda unless accompanied by a certificate signed by the person in charge of that island that such animals had not for three months previous to embarkation been within an area infected with Epizootic Lymphangitis, and that the fodder put on board with such animals had been taken from an area free from that disease.

The Trinidad *Mirror* of June 12 last, records the fact that at the monthly meeting of the Agricultural Society held on the 11th, it was reported by the Secretary that the following Resolution approving of the holding of an Annual Show in Port-of-Spain had been passed by a joint Committee of the Board of Agriculture and the Agricultural Society: 'That in the opinion of this joint Committee it is desirable that an Annual Show be held in Port-of-Spain provided that grants-in-aid to the extent of 1,000 dollars can be obtained over and above the contribution of the Agricultural Society, estimated at 500 dollars.'

During the last two years, says the *Louisiana Planter* for June 26, the production of sugar in the Argentine has greatly exceeded the consumption, and were it not for the great demand of Great Britain for sugar, the stocks of that article in the Argentine Republic would have assumed rather uncomfortable dimensions. The 1913 crop of 227,000 tons left the stock of 95,000 tons at the beginning of the new one in June 1914. This was also very large, producing no less than 273,000 tons. Apart from the quantities of sugar already sold to European destination, a further quantity of 100,000 tons will be disposable without in the least interfering with the wants of the country. As however the world's price is by far inferior to the inland price in the Argentine, the profits will not be large on these international transactions.

TEAK ON WASTE LAND.

The subject-matter of the *Philippine Agriculturist and Forester* for April 1915, is composed of a comprehensive report by Dr. E. B. Copeland, Dean of the Philippine College of Agriculture, on his visit to Java undertaken to furnish a basis for conclusions as to the desirable procedure in regard to a number of economic and agricultural matters in the Philippines. In more ways than one it is a very important report and will doubtless receive very widespread attention in the tropics. Being of a considerable length, and dealing with a diversity of subjects in a more or less detailed manner, a general review in this journal would not, it is believed, serve as useful a purpose as a treatment of some of its subjects individually. The following extract shows what Dr. Copeland says as regards teak, the cultivation of which is not without interest or possibilities in the West Indies. Teak grows well on high mountain lands and is a most valuable wood for building purposes, as it is perfectly resistant to termites and other pests. The growth of this tree has been very satisfactory in many of the West Indian islands, and several large specimens can be seen in the Botanic Gardens, Dominica, St. Vincent, Trinidad and Jamaica, as well as in private gardens and similar situations in other colonies. Dr. Copeland says:—

While Java is a conspicuously mountainous island, the mountains are isolated from one another, and there is no great plateau area above the limits of cultivation. The result is that the natural forest of Java occupies an altogether insignificant area, and that the products of the natural forests are of practically no economic importance whatever. Of the family Dipterocarpaceae, for instance, which compose the great bulk of the commercial forests of the Philippines [see *Agricultural News*, Vol. XIV, No. 345, p. 233] I did not see one tree in Java except those in the Botanic Gardens at Buitenzorg. The large income of the Forest Service is derived then almost altogether from forests which are not merely under control, but are composed of trees planted by hand, and afterwards attended to with a care which is unfortunately often wanting in orchards and coco-nut groves in the Philippines. The crop is always teak. The teak forests of Java occupy approximately 700,000 hectares. The country where teak is planted originally contained teak and a mixture of other trees in a state of nature, and as it has been lumbered off, teak, in pure stand, has been systematically planted in its place. There was a time when these teak plantations were seriously damaged by fire. The cultural system of Java does not permit damage of this kind to continue indefinitely, and after various attempts to handle the fire problem in other ways, recourse was had to planting, with the teak, trees which would keep the ground in such condition that the spread of fire should be impossible. For this purpose, it was natural that leguminous plants should be chosen in order that the ground could be enriched at the same time that it is protected. The first choice for this work was formerly given to a species of Indigofera. About six years ago, *Leucaena glauca*, the Ipil-ipil of the Philippines, was tested extensively for this purpose, and proved so superior to any other plant that, except on very low-lying ground where Indigofera thrives better, the use of *Leucaena glauca* is now universal in the teak forests. It is interesting to note that the procedure adopted on this very extensive scale in Java is the same which has been demonstrated by the Forestry Department of this College to be best on the small scale on which we are working here. The teak and *Leucaena glauca* are planted at the same time on land which is made clean enough for any agricultural crop. Both are rapid growers as soon as they get started. The Leucaena sometimes grows somewhat more rapidly at first, and is planted thickly enough to shade the ground completely and make the growth of grass or weeds impossible. Grass is practically unknown now in the Javan teak forests, and with its elimination, all danger from fire in young plantings has disappeared. In the best situations, the teak reaches a height of 10 metres in two years. The Leucaena is pollarded when it reaches a diameter of about 5 centimetres, and the stems and foliage cut down are permitted to decay upon the ground. It grows again from the stumps, and in this way continues to shelter the ground very perfectly. Teak is not planted in the very wet western part of Java, and in the drier region which is devoted to it, it would not, during the drier seasons, itself shade the ground completely enough to eliminate the possibility of the spread of fire when the ground is thickly covered with its dry leaves.

HEDGES.

In the *Agricultural News* for March 13, 1915, there appeared a leading article dealing with the importance of enclosures from various aspects. Part of this article was assigned to a brief account of the different West Indian plants suitable for hedges, but no definite data were presented. In the following note, which concerns observations made in Montserrat in 1904, will be found some useful facts which should be compared with more recent information obtainable locally in the different islands:—

Rows of the following plants were grown to test their suitability for hedges, and also to compare the rate and habits of growth of each:—

Cushaw (*Acacia tortuosa*), raised from seed 1903; height, $4\frac{1}{2}$ feet; dense growth.

Logwood (*Haematoxylon campechianum*), raised from seed 1902; height, 5 feet.

Wild coffee (*Clerodendron aculeatum*), raised from cuttings 1903; height, $2\frac{1}{2}$ feet.

Myrtle lime (*Triphasia trifoliata*), raised from seed 1903; height, $1\frac{1}{2}$ feet.

Bread-and-cheese (*Pithecolobium unguis-cati*), raised from seed 1902. Has been cut back several times. Now a dense hedge, 2 feet high.

It is probable that the cushaw and logwood will be found to be the best plants for the purpose of hedges. Seeds can readily be obtained from the wild plants in May. As both plants are rapid growers it is better to sow the seed in the position required than to transplant.

The cost of establishing hedges with these plants must vary with the nature of the land. Approximately the cost per mile will be as follows:—

	£	s.	d.
Collecting seed		5	0
Breaking up land	1	10	0
Sowing seed		2	0
Two weedings		3	0
Total	2	0	0

The cost of trimming and supplying would be about 6*s*. per mile per annum. A double row, with interspace of 1 foot, should be sown.

FUNGUS NOTES.

A NEW FORM OF BLACK ROOT DISEASE ON CACAO.

The following extract is taken from a report made by Mr. Wm. Nowell, Mycologist to the Imperial Department of Agriculture, on fungus diseases of cacao in Grenada. After a discussion of the familiar type of black root disease, found in wet districts in Grenada, as in St. Lucia and Dominica, the report continues under the heading The Lowland Form, as follows:—

The cases of cacao root disease seen during this visit on the lowland estates presented some constant features of difference in their symptoms from the disease already described.

This might have been put down to the effects of drier conditions had not the finding in connexion with the disease on two widely separated estates of the perithecia of a distinct species of Rosellinia led to the conclusion that we shall have to recognize the existence of a separate, though close allied, disease.

On one of the estates earliest visited I was shown a group of dead and dying trees, which though ascribed by our conductor to beetle injury, had the general appearance of the effects of root disease. I had the collars and surface roots of several trees cleared but found no sign of Rosellinia mycelium. The regular occurrence of new suckers on the failing trees also presented a feature which I had been accustomed to regard as absent from cases of root disease. Time did not permit of the clearing of the lower roots. On the next estate an area to which attention was called as an example of the effects of thrips presented the same symptoms: trees slowly failing, putting out suckers low down on the trunk, and ultimately dying.

Again no symptoms were visible on the collar or the upper roots, but the general appearance of the group of trees was so typical of a root disease area that I arranged for a tree to be dug out. On the lower roots of this was present a white mycelium closely resembling that of the upland Rosellinia, but more scantily developed. The trouble in this instance appeared to have had its origin in infection from stumps of *tendre acailloux* (*Piptadenia peregrina*) two trees of which had been cut down a few years before.

The same type of disease was afterwards met with on several estates; the symptoms were as described above, and the presence of the characteristic mycelium was verified in most cases. The disease works in essentially the same way as the upland form already described, and ultimately produces the same sort of group of dead and dying trees. It appears however to be slower in its action, and the failure of the trees is much more lingering. With one exception, which may very well have been an isolated case of the upland disease, the smoky mycelium characteristic of that disease was not seen on the lowland estates. On two dead cacao stumps, one in the midst of a group of dead and dying trees, the other where a tree had been cut out, the perithecia already mentioned were found, associated with white radiating mycelium such as was found on the dying trees. The conidial fructifications found with the perithecia were old, but could be made out to have been of the same type as in other species of Rosellinia. The perithecia form a layer on the surface of the wood, looking like very fine shot dusted thickly upon it.

TREATMENT.

The treatment of this disease should follow upon exactly the same lines as that of the upland form: isolation of infected areas and contacts, complete destruction of infested trees. Diagnosis is much more difficult, and the planter may have to proceed largely upon suspicion. When one or two dead or dying trees have been dug out from a situation and the presence of the fungus verified, other cases occurring in similar circumstances may be recognized with more certainty. The slower rate of attack gives more chance of stopping the spread of the disease. It may even be more feasible to cure infected trees than is the case with the upland disease, and one planter claimed to have effected cures with lime or copperas. No tree which has not been isolated should however be allowed to remain in the hope of a cure, and no treatment should be attempted of trees which are far gone. The diseased roots which can be got at should be removed, lime forked into the soil, and the leaf area of the tree should be reduced to make up for the loss or failure of roots.

FIXATION OF ATMOSPHERIC NITROGEN ON A COMMERCIAL SCALE.

Besides constituting an important landmark in the development of agricultural science, the fixation of atmospheric nitrogen artificially is a notable matter at the present time, on account of the fact that those countries which are subjected to a blockade in the present war have largely to depend upon this method for obtaining substitutes for nitrate of soda. The *Louisiana Planter* for May 29 contains an instructive article on the subject from the pen of Dr. H. C. Prinsen Geerligs, and in this the different methods utilized are described.

The idea of utilizing atmospheric nitrogen originated with the British chemist, Sir William Crookes, and for many years now nitric acid has been made from nitrogen and oxygen of the atmosphere by forcing air through a chamber in which a very powerful electric lamp burns in a magnetic field. It will be unnecessary to describe in this article the various reactions which take place subsequent to the production of calcium nitrate, a salt which has already obtained considerable popularity as an artificial fertilizer.

A second method of fixation of atmospheric nitrogen is the heating of calcium carbide in a current of pure nitrogen gas. This method gives rise to the well-known calcium cyanamide, which so far has not proved very satisfactory as a manure.

A third and particularly interesting method consists in conducting a current of nitrogen gas over aluminium carbide, which has previously been prepared in an electric furnace from aluminium oxide and carbon. The reaction which follows, turns the aluminium into aluminium nitride, while a current of carbon monoxide escapes, which may be used as fuel. The aluminium nitride in its turn is transformed into aluminium oxide and ammonia, of which the former may be used as a raw material for the manufacture of metallic aluminium, while the latter is the nitrogenous material desired.

A new method, which is based on quite another principle, is the direct combination of nitrogen and hydrogen under pressure at somewhat elevated temperature in the presence of a catalytic agent. Under favourable circumstances a mixture of both gases combine to a very small percentage, while the reaction does not go farther as it is reversible, and will cease as soon as the certain equilibrium is attained. The mixture is sufficiently cooled to enable the ammonia to be tapped off in liquid form, and then the remaining mixture is again treated as before.

Some general considerations on the subject of nitrogen fixture are given by Dr. Geerligs in the journal above-quoted. It is pointed out that the source of energy used to bring about the desired combination is principally water power, which is inexhaustible as well as cheap. At the present time, however, only about 10 per cent. of the nitrogenous substances used in the world are obtained synthetically. Pertinent to the subject of this article is the report, already referred to in this journal, that the German Fermentation Industry Institute has found a means of converting the nitrogen of ammonia into albuminoids by means of the growth of yeast in a liquid containing sugar, ammonium sulphate and other salts. By forcing air through the liquid, the yeast is induced to grow very vigorously, and to form a large amount of organic matter. The dry substance formed is equal to the weight of the sugar employed, and about 40 per cent. of the dry substance formed thus, consists of albumen. These remarks indicate that in the near future it will be possible to obtain plant food and plant material itself of a nitrogenous kind on an unlimited scale artificially. The establishment of an industry capable of gaining such achievements would constitute an enormously valuable asset to any country depending on outside sources for its food supply.

Jamaica Agricultural Society.—At the monthly meeting of the Board of Management of the Jamaica Agricultural Society held on May 20, 1915, some interesting matters were discussed, and a report has been published in the Journal of the Society for June 1915. Concerning the subject of bananas, a table of analyses of banana meal made at the Imperial Institute is reproduced, which shows that while this material should prove useful locally as a supplementary food, it will not compare in nutritive value with either wheat flour or maize meal. Another reference to bananas is that which refers to an attempt made by the Society to persuade the authorities at home to utilize banana figs as food for the troops. These overtures appear to have been unsuccessful, though it is understood that a considerable quantity of banana figs has been sent to Great Britain as a war gift.

A fairly lengthy discussion took place at this meeting on the subject of Indian corn. Several of the branch societies have sent in resolutions urging that the Government should give preference to locally grown corn. The Government, though pleased to co-operate in the endeavour to substitute native corn for the imported at present used at the various institutions, point out that in the past it has been difficult, if not impossible, to get properly dried native corn of good quality that will keep. Corn weighing, say, 64 to 66 lb. to the bushel, which was often supplied, would not keep; the grain should be dried and sold at not more than 60 lb. to the bushel. The Society suggests that a central depôt should be established to which the corn could be sent, dried, and sold in large quantities to the consumer. It appears that the merchants in Kingston under these conditions are also quite willing to co-operate and support the local industry.

LIVE STOCK NOTES.

PIG FEEDING.

The following note, taken from the *Agricultural Gazette of New South Wales*, deals with the subject of pig feeding in enclosures, a system deserving of consideration in the West Indies. It will be noticed that the writer refers to certain temperate food crops like rape and mangel wurzels; for these can be substituted in the West Indies crops like Guinea corn and sweet potatoes.

The method of feeding which I think is the best, is to erect pig-proof fences, enclosing about 4 or 5 acres each, plant with maize in the spring, and turn in the pigs of all stages of growth. It will be found that not a grain will go to waste, but care must be taken to allow the pigs access to water. After they have finished the paddock, turn them into another, and plough the finished paddock and sow rape, field peas, vetches or mangel wurzels. Rape is one of the most valuable fodders for running pigs on; it is fit to feed off in about six weeks from sowing, and will last right through the winter if the land is well drained. Pigs of all ages thrive well on rape. Field peas and vetches are also crops on which pigs make rapid growth. All these are good for sows that are rearing litters. After the pigs are large enough to fatten, shut them up and top off with maize, milk, etc. I find that pigs fatten very quickly on maize after running on rape and other succulent crops. Moreover, this method cleans the land and puts it in good order for ploughing next spring. I have pulled very heavy crops of maize off land so treated and attribute the result to the fertilizing qualities of the manure . . . While on the subject of food, the importance of the mangel wurzel should be mentioned. Pigs are very fond of them, and thrive very quickly on them. The seeds are very shy to germinate, but they sometimes grow to a weight of 30 to 40 lb. each, and they are excellent keepers in the store and the ground. Lucerne is one of the best foods for pigs; in fact, it is almost indispensable on a well-regulated pig farm. It is an excellent diet at all stages of a pig's growth, and sows with litters, mother them well when fed on lucerne. In fattening with maize greater progress is made when lucerne or alfalfa is added to their diet. Arrowroot and sugar-cane are also excellent food, but take two long to mature. It is desirable to find faster maturing crops, and I think we have them in imphi, rape, vetches, field peas, mangels, and lucerne.

The most prized breeds of pigs are the Berkshire and the Poland China, and they cross with satisfactory results with any other breed. The larger breeds of pigs, such as the Tamworth and British Black, make too rapid growth without putting on the required amount of fat, and consequently become too weighty for first-class baconers. But when crossed with a fat-producing pig like the Poland China, they cannot be surpassed. The Poland China is looked upon in America as a lard-producing pig, and I find that of all the breeds of pigs (and I have had to do with them all) this breed will fatten when others will only keep in good condition.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, June 15, 1915.

ARROWROOT—2¼*d.* to 4¾*d.*
BALATA—Sheet, 2/2¾; block, 1/11 per lb.
BEESWAX—No quotations.
CACAO—Trinidad, 72/6 to 77/- per cwt.; Grenada, 70/- to 77/-; Jamaica, no quotations.
COFFEE—Jamaica, 49*s.* to 50*s.*
COPRA—West Indian, £22 per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 16*d.* to 16¾*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Jamaica, 55/- to 70/-.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 3/3 to 3/9; concentrated, no quotations; Otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations
MACE—9*d.* to 2/11*d.*
NUTMEGS—4¼*d.* to 5¾*d.*
PIMENTO—1⅞*d.* to 2 1/16*d.*
RUBBER—Para, fine hard, 2/7; fine soft, 2/2; Castilloa, 1/7.
RUM—Jamaica, 3/6.

New York.—Messrs. GILLESPIE BROS., & Co., July 8, 1915.

CACAO—Caracas, 15c. to 15¼c.; Grenada, 15c. to 15½c.; Trinidad, 15½c. to 18c.; Jamaica, 12½c. to 13c.
COCO-NUTS—Jamaica and Trinidad selects, $26·00 to $27·00; culls, $16·00 to $17·00.
COFFEE—Jamaica, 7¾c. to 11c. per lb.
GINGER—12½c. to 16c. per lb.
GOAT SKINS—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 38c. to 40c. per lb.
GRAPE FRUIT—Jamaica, $2·00 to $2·50.
LIMES.—$3·00 to $4·00.
MACE—47c. to 51c. per lb.
NUTMEGS—11c. to 11½c.
ORANGES—Jamaica, $2·00 to $2·25.
PIMENTO—3½c. per lb.
SUGAR—Centrifugals, 96°, 4·95c.; Muscovados, 89°, 4·30c.; Molasses, 89°, 4·17c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., July 12, 1915.

CACAO—Venezuelan, $15·50 to $16·25; Trinidad, $16·50 to 17·00.
COCO-NUT OIL—83c. per Imperial gallon.
COFFEE—Venezuelan, 12c. to 13c. per lb.
COPRA—$3·75 per 100 lb.
DHAL—No quotations.
ONIONS—$1·20 to $2·25 per 100 lb.
PEAS, SPLIT—$12·00 per bag.
POTATOES—English $2·00 to $2·25 per 100 lb.
RICE—Yellow, $6·00 to $6·25; White, $5·60 to $5·75 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. T. S. GARRAWAY & Co., July 26, 1915.

ARROWROOT—$4·00 to $4·50 per 100 lb.
CACAO—$14·00 to $14·50 per 100 lb.
COCO-NUTS—$16·00.
HAY—$1·90 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $85·00 per ton.
MOLASSES—No quotations.
ONIONS—$3·00 to $4·25 per 190 lb.
PEAS, SPLIT—no quotations; Canada, $5·40.
POTATOES—Nova Scotia, $3·25 per 160 lb.
RICE—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, no quotations.

British Guiana.—Messrs. WIETING & RICHTER, June 26, 1915; Messrs. SANDBACH, PARKER & Co., July 9, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	$10·00
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	14c. to 15c. per lb.	16c. per lb.
CASSAVA—	96c. to $1·20	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$10 to $15 per M.	$18 per M.
COFFEE—Creole	——	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14½c to 15c.
Liberian	10c. per lb.	10c. per lb.
DHAL—	——	——
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	4c. per lb.
Madeira	——	——
PEAS—Split	$12·00 to $12·50	$13·00 to $14·00 per bag. (210 lb.)
Marseilles	——	——
PLANTAINS—	16c. to 48c.	——
POTATOES—Nova Scotia	$4·00	$4·50
Lisbon	——	——
POTATOES—Sweet, B'bados	$2·00	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
TANNIAS—	——	——
YAMS—White	——	——
Buck	$2·64	——
SUGAR—Dark crystals	$3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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The Value of Birds.

LAWS for the protection of wild birds during certain seasons have been passed by most civilized countries in recent years, and many of the West Indian Colonies have not been backward in this respect. Such action has been taken because it has come to be generally accepted that birds are very indispensable allies to man in his struggle for existence, especially to the agriculturist. It becomes necessary therefore to protect these allies from the indiscriminate destruction, which since the introduction of firearms, has been made easy. There are four incentives which lead to the slaughter of wild birds. First, many species are good for food; secondly, many species possess plumage which is prized for ornamental purposes; thirdly, many species have been looked upon, rightly or wrongly, as vermin to be exterminated if possible; and lastly, there is the reckless mischief of the small boy.

It has been recorded from many places, that the wholesale destruction of any kind of bird for either of these four reasons, has led to disastrous results to the farmer or planter, on account of the increase of pests which destroy his crops when the number of natural enemies of these pests has been very much diminished. Hence the almost universal approval of laws for the protection of birds.

Birds are beneficial to man's interest not only when wild, as allies against the insect pests of his crops, but also as his servants when domesticated, and as assistants in his pursuit of knowledge, especially with regard to the laws which govern heredity and the transmission of characteristics from parents to offspring.

It may be of interest to take some examples of well-known West Indian birds, and to point out how they are of use to the West Indian farmer or planter, and in fact to the whole community.

It has been argued that the 'black bird' of Barbados, *Quiscalus fortirostris*, is not wholly beneficial to that island, because it has frequently been observed as a pest in fields of corn, and also destroys a good deal of fruit. When, however, the great number of grubs and other insects which it chiefly feeds on is taken into consideration, it would seem that it would be

very bad policy to attempt any diminution of its numbers.

Another valuable insect-eating bird is found in most of the smaller West Indian islands in *Tyrannus* sp. It is known in Barbados as 'rain-bird', in Antigua as 'loggerhead', and in the Virgin Islands as 'chicheree'. There is some ground for believing that the species of the Northern Islands is different to the one in Barbados, being a bolder and somewhat stouter bird. This bird lives exclusively on insects, taking them chiefly on the wing all day long, even up to late dusk. A further example of a useful group of birds are the woodpeckers, common in Trinidad and elsewhere. It may be noted, however, that in Trinidad birds, as a whole, are not considered to play an important part in keeping down insect pests.

It is a pity that laws cannot protect some birds from other enemies than men. The introduction of the East Indian mongoose into many of the West Indian islands, in order to destroy the rats which infested the cane-fields, has led in some of the smaller islands to the extermination of some of the most useful birds.

The 'tick-bird' of Jamaica, *Crotophaga Ani*, known in the Leeward and Windward Islands as 'black witch', is most useful to stock farmers. Its chief food consists of the ticks which are such a pest on beasts in these islands. The mongoose has exterminated it from Antigua, and nearly done the same in St. Croix, and subsequently, if not consequently, the plague of ticks on cattle has immensely increased.

Another case of extermination by the mongoose is that of the quail, *Ortyx virginianus*. This bird, like most of the grallatores, feeds not only on insects, but also on small seeds, and is therefore an example of another way in which birds help man's agriculture by consuming great quantities of seeds of weeds. The numerous flocks of quail formerly met with in Antigua and St. Croix are no longer to be seen.

In many of the islands the little ground dove, *Chamæpelia passerina*, which performs the same useful function of eating the seeds of weeds, has had its numbers much decreased by the mongoose, which is able to get at the eggs of this and the two last mentioned species, on account of their habit of nesting either on or near to the ground.

The domestication of birds is of importance with regard to their relationships with mankind. The farmyard birds, from turkeys to pigeons, are worth attention, as affording a nutritious and dainty supply of flesh food. Eggs, as everyone knows, may be made the basis of nutriment for human beings—great advances have been made of recent years in improving the fertility of the egg-laying bird-servants of men. Besides this use, a flock of fowls or turkeys on an estate helps to keep down insect pests. It is astonishing how many insects one of the domestic birds will devour, if given a free run, in the course of twenty-four hours.

Aquatic domesticated birds, like the duck, are also valuable in tropical countries for the manner in which they help to keep down mosquitoes. When a duck is dabbling in water no mosquito larva that comes within the strainers at the edge of its bill escapes.

Considering the number of species of birds, it is rather surprising that so few have been domesticated. From time to time there is an attempt made to add to this number. Possibly the cultivation of the ostrich, for the sake of shearing him of his ornamental plumes, is the most conspicuous success in this direction in modern times. Recently, however, success has attended the rearing of the egret, or white heron, in captivity, for the same object. Perhaps there is an opening for enterprise in this direction as to other birds, now wild in the tropics, sought for, and too indiscriminately killed for the sake of their plumage.

Modern scientific men who are, on Mendelian lines, trying to solve the problems of heredity, and the transmission of characteristics from generation to generation, find their most useful assistants in the domestic birds, especially the ordinary farmyard fowl. Their fertility, and the comparatively short interval between generations make them easy subjects for study on these lines. The future will probably show a still greater appreciation of the debt mankind owes to our feathered allies.*

SUGAR INDUSTRY.

BRITISH CANE SUGAR.

In discussing the sugar situation in this Journal at the beginning of the present year, a suggestion was put forward (see *Agricultural News* for February 13, 1915, p. 50) that each Department of Agriculture in the big undeveloped colonial possessions of the Empire, should forward to a central office a report on the prospects before an extension of cane-growing in each colony, respectively. It is now satisfactory to be able to state, that during the last six months the West India Committee has taken the matter up with considerable energy,

*For further information on West Indian birds see *West Indian Bulletin*, Vols. III, IV, and V.

and that in the last few issues of the *West India Committee Circular* there has appeared correspondence relating to the subject under consideration.

It will be realized that the object has been to make enquiry as to whether it would be possible in the near future for the British tropics to produce a sufficient quantity of sugar to make Great Britain independent of continental supplies. From the information that has been published in the *West India Committee Circular*, it would appear that there is more than enough suitable land awaiting cultivation, but before any large areas could be planted it would be necessary to make arrangements in regard to the supply of labour, and, in many places, in regard to irrigation, drainage, and the provision of central factories.

Referring to the northern provinces of Nigeria, Mr. P. H. Lamb, the Director of Agriculture, expresses the view that in the event of preferential treatment being given to colonial cane sugar, the possibilities of Nigeria as a source of supply are well worthy of careful enquiry. In speaking of the conditions under which cane can be grown in the northern provinces, Mr. Lamb states that irrigation is essential but should offer little difficulty along the river flats of the Niger or Benue. Here, it is said, suitable sites for very large plantations could be found, and in connexion with such situations it should be remembered that water transport is very economical. A plentiful supply of unskilled labour would be forthcoming at about 1*s.* per day.

With reference to the southern provinces of Nigeria, Mr. W. H. Johnson, Director of Agriculture, states that he is of opinion that vast areas of land in the vicinity of the various rivers and creeks in this country are admirably adapted for sugar growing under irrigation. It is admitted, however, that some difficulties might be encountered in regard to labour supply. In this connexion it has to be further borne in mind that there are difficulties as regards draft animals in Nigeria owing to the fatal nature of the disease known as Trypanosomiasis. Conditions would, however, appear to be favourable for traction which, on a large scale, would probably prove far more economical.

Turning to the possibilities of introducing cane cultivation into East Africa, a letter appears in the *West India Committee Circular* for July 13, 1915, from Mr. H. Powell, Chief of the Economic Plant Division, in which it is stated that there are nearly 330,000 acres of land suitable for cane cultivation, in that Protectorate. This area would produce at the lowest estimate 650,000 tons of sugar per annum, or very nearly one-third of the consumption of the United Kingdom.

In the reports received from the above mentioned colonies, it may be of interest to record that in each case it is stated that West Indian seedling canes are at present under trial, and are showing evidence of being suited to local conditions.

Previous to the above information concerning Africa, the West India Committee had published official reports from British Guiana, Mauritius, Fiji, Trinidad and Tobago, and the Leeward Islands, showing that under favourable conditions these colonies alone could produce more than enough sugar to meet the requirements of the United Kingdom, and displace the German and Austrian sugar, on which consumers in the United Kingdom were mainly dependent before the war. For example, it is estimated that British Guiana could produce 2,500,000 tons, which is as much as is imported into the United Kingdom from Germany in normal years.

WEST INDIAN SUGAR IN LONDON.

The *Produce Markets' Review* for July 10, 1915, publishes the the following statement in connexion with the prices for West Indian sugar in the London Market:—

The supply of West Indian Crystallised continues in excess of the demand, and values are in some instances again rather lower. It is difficult to account for this weakness, as the sugar is the cheapest grocery kind obtainable. It is cheaper than Yellow Crystals and could be sold at the same price in the shops, but of late years the distributor has regarded Demerara as an article of luxury, which should fetch in consequence a higher price than White Sugar. This is of course absurd, and without discussing the relative merits of White or Brown or Yellow Sugar, the fact remains that this season it is easier to buy West Indian Sugar in the market than any other kind, that it is purchasable at a lower price, that the profit to the retailer, even when sold at a popular figure, is remunerative, and finally, that the Sugar in question is British grown, and should, therefore, come into greater prominence, now that the United Kingdom has to look far afield for her supplies of Cane Sugar.

The Importance of Phosphorus.—The Ohio Agricultural Experiment Station has recently issued an important scientific publication consisting of a review of the literature of phosphorus compounds in animal metabolism. Running to nearly 750 pages this lengthy and exhaustive memoir presents for the benefit of the research student all the important facts that are known concerning the part played by phosphorus in the animal system.

To give the reader an idea of the importance of phosphorus, the following may be quoted from the introduction to the volume:—

'Among the several inorganic elements involved in animal life phosphorus is of especial interest. No other one enters into such a diversity of compounds and plays an important part in so many functions. Structurally, it is important as a constituent of every cell nucleus and so of all cellular structures; it is also prominent in the skeleton, in milk, in sexual elements, glandular tissue, and the nervous system. Functionally, it is involved in all cell multiplication, in the activation and control of enzyme actions, in the maintenance of neutrality in the organism, in the conduct of nerve stimuli, and through its relation to osmotic pressure, surface tension and imbibition of water by colloids, it has to do with the movement of liquids, with the maintenance of proper liquid contents of the tissues, with cell movements, and with absorption and secretion.'

A lengthy bibliography (120 pages), and an exhaustive index are appended to the book.

The age of goats according to their teeth is noted on in the *Experiment Station Record*, Vol. XXXII, No. 9. It appears that the termination of the period during which the incisors are replaced is nearly the same in goats as in early maturing sheep. The period between the replacing of the first and second incisors in sheep is about two months shorter than in goats, but the interval between the second and third pairs is shorter in goats. The temporary molars are replaced earlier in goats than in sheep, in goats shorter before the cutting of the third, in sheep only after the cutting of the latter or at the same time.

FRUIT AND FRUIT TREES.

MEASURING THE DEVELOPMENT OF A COCO-NUT ESTATE.

In his recent book on the Coco-nut, reviewed in this Volume on page 5, Dr. Copeland describes work that has been directed by him with a view to determining, by means of measurements, the rate of development of any coco-nut grove. It will be readily realized that the successful application of a scientific method such as this, would be a distinct advance on the present system of reporting, based on personal opinion. The following is Dr. Copeland's account of what has been done:—

During the past four years I have had made by students in the Philippine College of Agriculture a very extensive set of determinations of the rate of growth of coco-nut leaves. The total number of determinations of this kind to date is between ninety and one hundred thousand. The work is intended to give each student thorough first-hand knowledge of the rate at which the leaves of the coco-nuts may be expected to grow, of the influence of treatment, weather conditions, etc., upon the rate of growth, to qualify him to determine, by measurements of the rate of growth, the condition of coco-nut trees, or plantations, and their probable future production, and to give him such technical expertness that he can make these determinations rapidly and accurately. The trees at the College of Agriculture are on land which is not well adapted to this crop. The soil is shallow and heavy, and there is not at all times a proper supply of ground water. Moreover, the trees were largely infested by beetles when the land was purchased, and such trees never grow as rapidly as healthy ones would grow. Some of the trees were about ready to come into bearing when the land was bought, but others were so young that they have not yet come to maturity. The average of all the determinations which have been made here would therefore not be a fair figure as an indication of what ought to be expected from coco-nuts. In one of the groves which is best situated, and in which the sound trees are now in bearing, there are groups of trees in which the average growth of the youngest visible leaf is more than 4 centimetres a day. I believe that this figure may be taken as what ought to be expected of any coco-nuts on a tolerably well situated and managed estate.

Really good conditions or management will give higher figures than this. Thus, the nine trees observed by one student for the week ending November 25, 1911, showed the following growth in millimetres: 324, 399, 390, 427, 336, 345, 338, 375, 415. Tree No. 4, to choose one at random, showed the following growth at weekly intervals from August 24, 1911, to February 28, 1912: 316, 319, 217, 293, 395, 391, 462, 444, 422, 427, 403, 406, 798 (two weeks), 387, 367, 360, 349, 357, 347, 349, 351, 352, 365, 382, 384, 383, 382.

Young trees grow considerably more slowly than do adult trees. There is a progressive increase in the rate of growth from the time that young trees are first well established in their permanent places, at least up to the time that they come into full fruit. It is probable that the average rate in a grove continues to increase beyond this time, but on this point there are no observations. There are likewise no determinations of the rate of growth on the leaves of very old trees, but there is no doubt that such leaves grow more slowy. On shallow and, therefore, dry soil, the growth is constantly less rapid than where the soil is deeper and moister. We have patches of trees in which the average rate of growth is not more than 25 millimetres a day. Such trees come into bearing several years later than do trees 23 metres away on lower and deeper ground.

There is a natural and very evident relation between the rate of growth of the leaves and the amount of production of fruit. The rate of growth can be determined for most purposes within a few days so as to get an average for groves of considerable size. To get positive and reliable information as to the rate of production requires observations extending over many months. The easiest way in which one can secure reliable information as to the condition of a grove is, therefore, by determination of the rate of growth. This can be done in several different ways. The method which has proved most satisfactory is by drawing marks with Indian ink across the bases of the youngest and next youngest leaf, making one mark, half of which is on each leaf. The difference in height of the two halves of this mark, after one day or one week, shows the difference in rate of growth of the two leaves. A similar mark is placed on the base of the next to the youngest leaf, called No. 2, and the third youngest, called No. 3. The break in this mark after a day or a week shows the difference in growth between these two leaves. Similarly the difference between the growth of leaf No. 3 and leaf No. 4, of leaf No. 4 and leaf No. 5, and of leaf No. 5 and leaf No. 6, is determined. The lowest mark, which remains unbroken, will be on the two youngest leaves which have ceased to grow. The sum of the observed breaks in the marks is the growth of the youngest leaf for the period in question.

On active trees at least four leaves ought always to show growth. It is common for five leaves to grow, but rare for six leaves to do so at the same time. The youngest two leaves frequently grow at the same rate. Successive older ones grow progressively more slowly, so that the oldest one which grows at all grows very slowly indeed. Growth is always more rapid during the night than during the day. The difference between night and day is much more marked in unsuitably dry weather than it is when the trees are well supplied with water. The effect of drought is likewise greater on young trees than on adult ones, and the difference between night and day is greater in younger trees when they are unduly dry than it is in older trees. Extreme drought brings a practical cessation of the growth of young seedlings.

Some Experiments in Pine-apple Planting.— Experiments have been conducted at the Philippine College of Agriculture with the following objects: (1) to test the varieties known elsewhere in the islands side by side with the varieties formerly grown here; (2) to compare planting in furrows and on ridges; (3) to test the effect of irrigation; (4) to determine the effect of certain manures; (5) to determine rates of growth; (6) to compare ratoons, suckers, slips, and crowns as planting stock.

It has been found as a result, that pine-apples planted 1 by 1 metre have sufficient space for cultivation, and there is no overcrowding in the plants. This distance may be decreased in the rows if desired. The leaves at the butt of the plant should be pulled off before planting. This permits better rooting and ealier growth. The following varieties are recommended as very suitable for being grown on ridges:

Smooth Cayenne, Sugar Loaf, Hawaiian No. 275, Japanese, Costa, and Baboy. The growing on ridges is, on the whole, better than that in the furrows, and in some varieties, as in the Smooth Cayenne, Costa and Baboy, the flowering is earlier. As regards the result of manurial experiments, it is stated that the application of fertilizers caused rapid growth, and the production of large plants with large, dark-green fleshy leaves, but did not affect the time of flowering. The weight of the fruit of the Smooth Cayenne averaged more when grown on the ridges than in the furrows. It is reccommended that Smooth Cayenne and Sugar Loaf should be grown from suckers, and the Costa and the Baboy varieties from crowns.

Further details in regard to these experiments may be had by reference to the *Philippine Agriculturist and Forester* for May 1915.

CITRUS MANURIAL EXPERIMENTS IN PORTO RICO.

Some important manurial experiments have been carried out in Porto Rico with oranges and grape fruit, and the results are published in *Bulletin No. 18* of the Agricultural Experiment Station. The response to manuring was very prompt, and the effect pronounced on both trees and quantity of fruit produced. The weight of fruit per tree harvested from the controls was but 27 per cent. of that from the trees given a complete fertilizer. The fruit ripened earlier in the control plots than in the manured plots. The following are the general conclusions arrived at:—

The theory that fertilizer requirements for a plant may be determined definitely by the chemical analysis of the soil in which it is growing has been abandoned, as the food elements may be present in abundance, but insoluble or too slowly available to the plants for their support. The analyses of the orchard soils where these experiments were are, however, of unusual value, as they show the actual quantity of food elements in the soil which may become available for the trees, and that these elements are present in such small quantities that a thrifty profitable orchard could not be maintained without the addition of fertilizer.

It would be impossible to give a formula which would provide for the fertilizer needed in all orchards in Porto Rico, although the results of the experiments under consideration point to one which may be recommended for those having like conditions. As the weather conditions in the citrus-growing sections on the north side of the island are almost uniform, this will include localities where the soil is of a rather compact, red, sandy clay, or red, sandy clay loam. Practically all the land in the citrus-growing sections on the north side of the island except the sandy beach land answers this description. For trees of the age of those in the experiment at the time the harvests were recorded, a fertilizer formula providing for 3 per cent. nitrogen, 12 per cent. phosphoric acid, and 12 per cent. potash is recommended. This formula is suggested for use until the exact needs in individual localities are determined. For older trees which have passed their maximum annual growth, it would probably be economical to decrease the nitrogen content slightly.

The quantity of fertilizer required varies with the age and general conditions surrounding the tree, but the experiments indicate that for trees six to eight years old, which are producing good crops, 20 lb. per tree should probably be the minimum. Much larger quantities have been applied in Porto Rico with good results.

DIGESTIBILITY OF SOME TROPICAL FOODSTUFFS.

The following abstract dealing with digestibility experiments is taken from the *Experiment Station Record*:—

Molassine meal is described as an English product composed of substantially 70 to 75 per cent. of cane or beet molasses, and from 25 to 30 per cent. of sphagnum moss, and has the following approximate composition: water 18·43, protein 9·32, fat 0·47, nitrogen-free extract 57·51, fibre 6·75, and ash 7·52 per cent.

Six cows were fed by the reversal method in periods of three weeks' duration, a basal ration of hay, wheat bran, and cotton seed meal, to which were added definite amounts of either molassine or corn meal. The total average daily nutrients were somewhat less for the molassine ration than for the corn meal ration. The cows produced substantially 14 per cent. more milk, and 16 per cent. more solids and fat on the corn meal ration than they did on the molassine ration. The cost per quart of milk on the corn meal ration was 3·1c. per lb., of butter 26c.; on the molassine meal ration 3·8 and 33c., respectively. Successful trials in feeding this product to horses are also reported. Molasses as a feeding stuff is discussed.

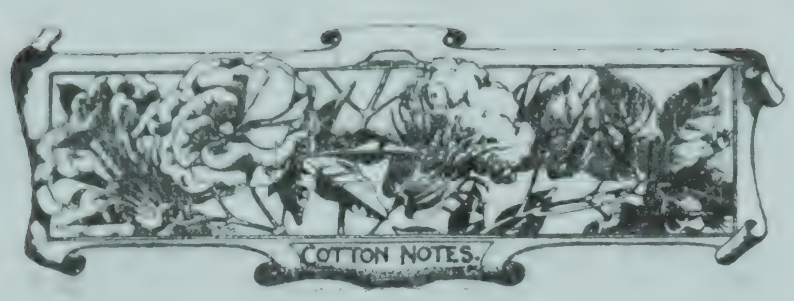
Analyses are given of cotton seed meal, cotton seed hulls, cotton seed hull bran, and cotton seed feed meal. It was found that low grade cotton seed meal contained about 30 per cent. less digestible organic matter than the high grade material. It is stated that the addition of hulls to cotton seed meal, even in small amounts, lessens its feeding value by decreasing its protein content and impairing its digestibility. Cotton seed feed meal containing choice cotton seed meal and cotton seed hull bran in equal parts has about one-half the feeding value of choice cotton seed meal.

Cacao shells are described as hard, outside coating or bran of the cacao bean. Their use in this country as a feeding stuff has been quite limited, but in Europe they are used as a partial feed for horses and cattle, and as an adulterant for oil cakes. Large quantities are also used by the Swiss as a feed for draft oxen. It is held that they act as a stimulant to the nerves and muscles, and enable the animals to do a greater amount of work. An analysis is reported as follows: water 4·5, protein 13·9, fat 4·91, nitrogen-free extract 55·61, fibre 12·65, and ash 8·43 per cent.

In feeding trials with wheat screenings the fibre did not appear to be at all digestible, indicating somewhat of a depressing effect upon the fibre digestibility of the hay, and the fibre contained in the weed seeds of the screenings was of decidedly inferior character. In chemical composition and digestibility the screenings did not appear to vary greatly from wheat bran.

In experiments with sheep, the following *coefficients of digestibility* were obtained for the several products:—

Kind of feed.	Dry matter, per cent.	Protein, per cent.	Fat, per cent.	Nitrogen-free extract, per cent.	Fibre, per cent.	Ash, per cent.
Molassine meal	61·98	41·74	—	71·90	—	79·48
Coton seed feed meal	58·23	74·96	100·66	61·20	26·10	49·37
Cacao shells	57·52	11·47	100·48	73·46	50·66	13·64
Wheat screenings	62·94	71·79	88·45	73·19	—	—



COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date July 27, 1915, with reference to the sales of West Indian Sea Island cotton:—

There has been no enquiry for Sea Island cotton since our last report, and we see no prospect of much improvement until Belgium and Northern France are free of the German occupation.

This report shows that the total exports of Sea Island cotton from the United States to Liverpool and Manchester, up to July 3, 1915, were 103 and 1,819 bales, respectively.

ANNUAL REPORT OF THE BRITISH COTTON GROWING ASSOCIATION FOR 1914.

The references to the West Indies which appear in this publication concern matters many of which are by this time familiar to our readers. In regard to the demand for Sea Island cotton it is pointed out that this fell away at the outbreak of the war and resulted in the decision arrived at by many planters in the West Indies to reduce their areas and cultivate increased quantities of sugar and other produce, which at present command relatively higher prices than cotton. The situation changed however when a few months later the Council arranged for the Fine Spinners' and Doublers' Association to guarantee a minimum price for the cotton grown in the different West Indian islands during 1915-16 season. It may not be fully appreciated in the West Indies the large extent to which the British Cotton Growing Association was instrumental in bringing about this guarantee.

Turning to more general matters connected with the work of the association, it is recorded that the association took part in the International Congress of Tropical Agriculture, and in the International Cotton Fibres and other Tropical Products Exhibition held about the same time. The Association generously offered several silver cups for the best exhibits of different kinds of cotton, and did everything in its power to stimulate increased interest in their crop. During the year the Association had the opportunity of meeting several of the Agricultural Officers from the different colonies and protectorates, including Mr. S. Simpson, Director of Agriculture for Uganda; Mr. J. S. J. McCall, Director of Agriculture for Nyasaland; and Mr. W. N. Sands, Agricultural Superintendent of St. Vincent.

It is recorded in the report that the exports of cotton from the West Indies for the year ended September 30, 1914, amounted to 1,905,237 lb. of Sea Island, and 416,125 lb. of Marie Galante cotton, giving a total of 6,000 bales of 400 lb. each, and a value of £135,321.

A NEW VEGETABLE DYE.

The current interest in dyes renders the following note from the *Experiment Station Record* worthy of some attention in the West Indies, especially as this orange dye can be used as a substitute for fustic:—

As a rule the trunk of an Osage orange tree is small in size, mis-shapen, and generally defective as a saw log, and, although because of the valuable properties of the wood (for wagon felloes especially,) closer utilization will scarcely be found in the use of any other wood, comparatively large amounts of waste are produced annually.

Osage orange has long been used in Texas in a small way as a dyewood. The roots, bark, and wood are chipped and boiled with water and a more or less permanent yellow is obtained from the extract. As a result of the investigation it was found that the quality and quantity of the dyestuff present is almost identical with that of fustic.

Osage orange may be employed as a dyewood in all cases where fustic wood is used at present. The yellows produced by direct dyeing or by aluminum and tin mordants are too fugitive to be of commercial value. But the orange yellows, old gold, deep tan, olive and chocolate shades obtained with chromium and iron mordants are equal to, if not better than, those obtained with fustic and are of sufficient fastness to be of commercial value.

A domestic source of a yellow dyewood has been found that can advantageously replace a foreign material used at present. The mill waste alone from the present manufacture of Osage orange amounts to over 25,000 tons annually; and if this waste could be set down in the East for $10 or $12 per ton, it is believed that it could compete successfully with fustic, both from cost of production and quality of colour produced on dyeing.

CLEAN MILK.

The National Clean Milk Society (2 Soho Square, London W.), which has been formed to improve the milk supply of Great Britain and Ireland, has published a pamphlet showing how by a system of marks it is possible to conduct the inspection of dairy farms in an efficient and educational manner. The score-card system which has been developed so largely in the United States for judging stock, agricultural produce, etc., has also been applied to the inspection of dairy farms, town dairies, etc. By making alterations that would bring the score-card more in touch with British conditions, it has been possible to arrive at what promises to be a most satisfactory way of judging of the sanitary condition of any farm that is producing milk for human consumption. The score-card is divided into two main sections: one section dealing with equipment, the other with methods, and 60 per cent. of the total marks is allotted to the latter. Most excellent explanatory notes are appended to the score-card, and are presumably intended for the guidance of the inspector. A perusal of them would be of great value to the farmer himself, for frequently lack of cleanliness is due more to failure to appreciate the necessity of being careful in the handling of such an important food as milk than to any desire to evade regulations. Sanitary inspectors in particular should see this pamphlet, and if every landowner would take the trouble to observe how large a proportion of marks on the score-card depend upon the cowshed, there might be improvements in farm buildings. (*Nature*, July 1, 1915.)

BARBADOS: REPORT ON THE LOCAL DEPARTMENT OF AGRICULTURE FOR 1913-14.

The important work of the Department of Agriculture, namely, the experiments with sugar-cane, is dealt with each year in a separate publication, but in the present report there appear brief references to this work which are of special interest. In regard to the yields of different plant canes under cultivation, the following is stated: B.6450, cultivated on 1,079 acres, gave 25·63 tons of cane per acre; B.376 from 385 acres gave 23·33 tons of cane per acre; B.147 from 203 acres, gave 22·97 tons of canes per acre; and White Transparent from 67·75 acres, 20·57 tons of cane per acre. These figures refer to the black soil districts. In the red soil districts, the yields of the plant canes were, on the average, as follows: B.6450 from 114 acres, 32·85 tons of canes per acre; B.376 from 229 acres, 28·93 tons of canes per acre; and White Transparent from 10 acres, 24·21 tons of canes per acre. As regards ratoons, B.6450 has also behaved satisfactorily in comparison with White Transparent. In referring to the financial gain realized by the island through the introduction of B.6450, it is estimated that the increased yields would be, if 30,000 acres were of B.6450, about 15,000 tons of sugar. The value of this would be about £160,000.

Proceeding to an account of the cotton industry, mention is made of the selection work that is being continued from past years, and in the case of two varieties phenomenally high yields are recorded, of which the significance cannot be gauged without further information as to the number of plants on which the calculation is based. As regards the manuring of cotton, it is stated that the best result was obtained where 30 lb. of nitrogen as sulphate of ammonia, 60 lb. of phosphoric acid, and 10 lb. of potash were applied per acre. In this case, after deducting the cost of the manure from the value of the incremental cotton obtained in excess of that yielded by the no-manure plot, there remained a balance of $4·41 as the gain from the application of manure.

Several pages in the report are devoted to provision crops. Trials have been made with different varieties of cassava, including Barbados seedlings, and an effort has been made to instruct the peasantry in the matter of making farine, meal, starch, and cakes. One of the Barbados cassava seedlings, namely B.1012, yielded during the year under review, over 10,000 lb per acre, compared with an average of about 4,000lb. It would seem that 10,000 lb. is a maximum limit to the range of yields, and 2,000 lb. the minimum limit. That is to say, neither the higher nor the lower figure can be depended on. Closely connected with the cassava trials are the experiments with various leguminosae. A large number of beans and peas have been under trial, and the results obtained are likely to be of much value. In regard to maize, an interesting event during the year under review was the importation of a drought-resisting form described in the *Journal of Agricultural Research*, and referred to in the *Agricultural News*, which is grown by the Indians of New Mexico and Arizona. Although sufficient time has not elapsed for a definite decision, there are indications that this variety of maize may be suited for cultivation in the drier districts of the island.

Turning to the subject of the exportation of fruit and vegetables, a somwhat lengthy account is given of the efforts made during the past two years to work up a trade in melons between Barbados and New York. In spite of continued difficulties in regard to steamer transportation, it was found at the end of the year that the net amount realized from $1\frac{1}{8}$ acres was £15 9*s*.

The remaining portion of the Superintendent's report deals principally with matters concerning exhibitions, fumigation troubles, and education, and is followed by a special report by the Assistant Superintendent of Agriculture on the entomological and mycological work carried out during a portion of the year under review. Lengthy rainfall statistics are appended.

THE EFFECT OF CANE TOP FODDER ON THE CONSISTENCY OF BUTTER.

As a result of feeding sugar-cane tops to dairy cattle in Barbados, the statement is definitely made by at least one dairyman, that the consistency of the butter produced is adversely affected as soon as the cows are fed on cane tops.

Cane tops are the most readily available green fodder on certain estates for a considerable part of the year, and would seem to be a food eminently suited to the production of milk and butter. It is found, however, that a diet of sugar-cane tops results in the production of a soft butter without grain. This is an undesirable quality, and in addition, such butter is more difficult to work and to free from the butter-milk.

It would be interesting and useful to have the results of experience in other tropical localities with regard to the feeding of sugar-cane tops to dairy cattle.

MANURING OF CACAO.

Bulletin No. 14, issued by the Department of Agriculture, Ceylon, contains the results of manurial experiments with cacao, carried on over a series of years. The following are some of the more important conclusions:—

Ammonium sulphate gave the best results for the six years' manuring. There was an increase in the crop the first year after manuring ceased, and then the yield fell off rapidly.

Potassium chloride plot yield fell off rapidly after the manuring stopped, while potassium sulphate had a more lasting effect.

Potassium sulphate and precipitated phosphate plot showed a marked increase the year after manuring ceased, and then fell off to the lowest position.

The effect of fish was marked for one year after the manure stopped, but the yield then fell off rapidly.

Castor cake, alone, or with basic slag, had a more lasting effect than ground nut cake, alone, or with potassium sulphate.

Bloodmeal also had a good effect over the two years after the last application, this plot rising to the second place.

Trenching and burying organic matter with lime had little beneficial effect, but with basic slag the results were slightly more satisfactory.

The three plots 99, 100, and 107 were treated with organic nitrogenous manures. These having done best, it would seem that for cacao, nitrogen is best applied in this form.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the value of birds to the agriculturist, in particular regard to West Indian species.

Under the heading of Fruit and Fruit Trees will be found interesting articles dealing with coco-nuts, pine-apples, and citrus fruit.

On page 263 is reviewed the report of the Barbados Department of Agriculture for 1914-15.

Two interesting notes will be found on page 267 dealing with practical methods of eradicating weeds.

Insect and Fungus Notes, on pages 266 and 270, respectively, deal with pests in Barbados, and lime as a factor in resistance to disease, as well as other matters of interest.

Telephone Troubles in the Tropics.

In the *Colonial Journal* for July 1915, reference is made to the troubles in hot, damp countries to which telephones are subject, and which are said to be due to the great amount of water that air at high temperatures can hold, and to the energy and ingenuity of the insects which appear to take a special fancy to telephones. With these troubles, and ways of meeting them, Mr. W. Llewellyn Preece deals in a paper read before the Institution of Electrical Engineers in March last. The spider, he states, is a real pest all over the tropics: it delights to retreat into the telephone case and to build for itself a nest therein, so that it is no uncommon experience to find instruments entirely *hors de combat* from the diligent work of the insect. To circumvent the spider, it is suggested that the telephone cases should be sealed up as closely as possible. Insects also settle on the insulators on overhead lines, and their webs connect the wire to the insulator stalk, thereby reducing the insulation resistance of the wire to a few ohms. In British Guiana it has been found that glass insulators prevent this practice, probably because the insects like a dark place for their home. Another trouble is lightning, which causes numerous interruptions. These are due to the strong discharges through the protectors to earth, which carry so much carbon dust across the gap as to place the two carbon blocks in contact. The remedy suggested here, is to use a vacuum type of protector in which the two carbon blocks are inserted in an exhausted glass tube, the opposite surfaces being serrated and fixed about $\frac{1}{16}$-inch apart; these, it is said, have been adopted in the Malay States.

New Vegetable Products.

In the *Chamber of Commerce Journal* (Supplement) for July 1915, mention is made of new vegetable products that are likely to become of considerable commercial importance in the United Kingdom in the very near future, in consequence of the changed conditions that have been brought about by the war. Amongst these is palm kernel cake. Before the war, palm kernel and copra crushing industries were practically German monopolies; the import of palm kernels alone to Hamburg exceeded $5\frac{1}{4}$ millions sterling in value in a single year. In Germany these cakes are regularly fed to milch cows and other live-stock. In the United Kingdom their valuable food properties have been established by analysis at the Imperial Institute and elsewhere, and it is hoped that large palm kernel and copra crushing industries will ere long be built up there—indeed, a start in this direction has already been made. The question has also been taken up energetically by the West African Section of the London Chamber of Commerce, and at the suggestion of Sir Owen Philipps (the Chairman of the Section) the leading British Agricultural Colleges are now conducting feeding trials with palm kernel cake.

Mention is also made of a plant which grows wild in British Honduras, particularly in the Orange Walk and Congo districts towards the Mexican border, and which bears a valuable fibre. The plant is called by the natives 'silk grass' on account of the fineness and strength of the fibres it contains. In appearance it is somewhat like the henequen, but the leaves are much longer, sometimes attaining to 9 feet; fifty, seventy-five or a hundred leaves are found on one plant. The plant is propagated by suckers, and is of fairly rapid growth. From the fibres fishing lines of great strength and durability are made, only a few strands sufficing to make a line capable of holding large fish; hammocks are also made of it. In a report on samples of this fibre, the United States Department of Agriculture says, it is evidently 'pita floja', obtained from the pita floja plant, *Ananas macrodontes*. This plant 'is closely related to the pine-apple, and its fibre is superior to the piña fibre of the Philippines. It is possible that this fibre might be successfuly cleaned by some modified form of machines used for cleaning henequeen and sisal. . . . . Pita floja fibre has long been recognized as a fibre of great promise, and in small quantities it commands a high price in Mexico for domestic use, but owing to the difficulty of cleaning it by hand, it has never been placed upon the market in sufficient quantities to become of commercial importance.'

Rainfall and the 'Degree of Wetness'.

Mr. Walter, F.R.A.S., in his book The Sugar Industry of Mauritius, which is a mathematical study in correlation, points out that the number of rainy days plays as important, if not a more important, part in the formation of the sugar crop than the amount of rain. Many planters are quite aware of this, but Mr. Walter gives to the idea an accurate expression. In order to introduce the combined effect of quantity and chronological distribution, he treats the Mauritius rainfall data in the following manner with interesting results. The degree of wetness of any month is considered to be represented by the expression

$$\frac{R\ t'}{t}$$

where R is the total rainfall in the month, t the number of days, and t', the number of rainy days. The effect of this expression is to give any rainfall R, a weight corresponding to the number of days during which rain fell. It is very evident that if a rainfall of 5 inches occurs on one day in any month, and in another is distributed more or less evenly over twenty days, the latter is the wetter month, from an agricultural point of view at least, than the former, and we should obtain as a result:—

$$(5 \div 30) = \cdot 167$$
$$(5 \div 30) \times 20 = 3 \cdot 333$$

respectively, as the relative degree of wetness for the two months.

Wr. Walter publishes a table showing the distinct correlation that exists between this ratio and crop yields. For example, in Mauritius in 1897 the degree of wetness for the growing season (October to May) was 7·62, and the weight of cane harvested was only 6·63. In the next year the degree of wetness was 24·33, and the weight of cane harvested was 25·03. The circumstance that total rainfall is only one factor to be considered is made clear by several instances to be observed in Mr. Walter's tables, where low yields of cane occurred in years of good total rainfall. For example, in 1901 the total rainfall was 40·05 inches for the growing season, and the yield of cane was as low as 16·38 because the degree of wetness was only 20·49. In 1893 the rainfall was only 37·67 inches, but as the degree of wetness was 24·33, the yield of cane recorded was as high as 25·03.

It is hardly necessary to point out that the above correlation is not inflexible and, indeed, may in certain years become secondary to other relationships. Still when considering the rainfall of a district, or of an estate, it is always well not to be content with totals, but to enquire also into the records showing chronological distribution.

Utilizing Coffee Pulp as Manure.

In the July issue of *Tropical Life*, Mr. R. D. Anstead, Planting Expert to the United Planters' Association of Southern India, contributes an article on the above subject. Coffee pulp as it comes from the pulper contains a large amount of water, and although it also contains a considerable quantity of nitrogen, phosphoric acid, and potash, it is unsuitable for manurial purposes in the fresh state, and must therefore be rotted down. If properly conserved and composted, it then supplies a valuable form of manure at a low cost, containing between 50 and 90 per cent. of organic matter.

Two methods of composting the pulp are recommended: if cattle are available on the estate the pulp is best used by removing it from the pith, drying it and then spreading it daily on the floor of the cattle shed and dusting it with bone meal. The cattle trample it with their litter, and it is removed once a fortnight and put in a water-tight pit, protected by a shelter from the rain and sun.

When cattle are not available the pulp should be allowed to drain and then be placed in water-tight tanks constructed for the purpose and mixed with bone meal at the rate of 1 cwt. for each ton of pulp. Alternate layers of pulp and general refuse are placed in the tank until it is full, the whole well compacted are protected from the rain and sun first by a covering of 1 foot of dry earth and then a shelter, and left to rot down. Although not as good as the manure made by the cattle method, it is no less a useful material produced at a low cost. It is important to bear in mind that both kinds of manure are rich in potash, a constituent for which there is a great demand at the present time. It is also important to direct attention to the fact that it is a bad practice to mix lime with the pulp, for when this is done there is a consequent loss of nitrogen.

INSECT NOTES.

INSECT PESTS IN BARBADOS, IN 1913-14.

The Report on the Barbados Department of Agriculture for the year ended March 31, 1914, has been issued as a Supplement to the Barbados *Official Gazette* of July 26, 1915. The last report in this series, that for 1912-13, was reviewed, with reference to those portions relating to insect pests and fungoid diseases, in the *Agricultural News* for May 23, 1914 (Vol. XIII, p. 170).

The sections of the report which deal with insect pests of cultivated crops are mostly considered in the portion prepared by Mr. J. S. Dash, Assistant Superintendent, whilst the Superintendent of the Department, Mr. J. R. Bovell, I.S.O., contributes a few remarks on the fumigation of plants, millions, and insect pests and fungoid diseases.

Mr. Dash assumed the position of Assistant Superintendent on February 21, 1914, less than two months previous to the end of the period covered by the report, and consequently, there is but little new recorded in the work on insects pests.

TERMITES ATTACKING SUGAR-CANE.

An interesting account is given, however, of an attack of termites on sugarcane in Barbados. This is probably the first record of termites attacking sugar-cane in Barbados.

It is suggested that this insect is a species of the genus Eutermes.

The attack was noted during the reaping season in both old, i.e., ripe, and young canes. The attack appears to have been a severe one, but the area over which it occurred is not given. Prompt action in fumigating the nests and burning the infested trash, stumps, and other refuse appears to have checked the attack. It was recommended that the young canes which were badly attacked should be removed and replaced by another crop, such as cotton, which would not be attacked.

Trial was made with an ant-destroying machine in fumigating these termite nests. The machine consists of a cylinder in which a mixture of arsenic and sulphur is burnt by means of a charcoal fire, the fumes being pumped into the nest by means of a pump and flexible tubing. [This would appear to be the same machine as that described in the *Agricultural News*, Vol. XI, p. 122, under the heading A New Method of Controlling Termites.]

LIME SULPHUR PAINT.

Another interesting note in the report is the mention of the use of a lime sulphur paint for killing scale insects on the trunks of trees. The idea apparently comes from Queensland.

The paint is made by boiling together 2 lb. sulphur and 1 lb. unslaked lime in 2 gallons water for one and a half hours. At the end of this time 3 lb. more unslaked lime is added and boiling continued for another half hour. The mixture then should amount to 2 gallons, and boiling water should be added to bring it up to this amount. Flour or fine clay should be added to bring the mixture to the consistency of a thin paint. It is applied with a paint brush to the trunks and large branches of trees infested with scale insects.

This paint is said to exercise a caustic action on the scales, causing them to fall off. [The caustic action might be too much for trees with thin bark, and planters would do well to try it cautiously on one or two trees before making a general application.]

SUGAR-CANE INSECTS.

Very little is added to the information given in former reports in regard to insect pests of sugar-cane. Mention is made of the brown hard back (*Phytalus smithi*) and the fact that it had become more numerous in certain districts in the island and that efforts were being made to transport the parasite, *Tiphia parallela*, from those districts where it was abundant to those where the brown hard back was becoming more troublesome.

The root borer (*Diaprepes abbreviatus*) also is mentioned as an important pest. This insect now (at the time of the report) occurs in nine parishes in the island as a pest. This would indicate a much wider distribution than has been formerly recorded.

The occurrence of the Leeward Islands root borer (*Exophthalmus esuriens*) in Barbados is mentioned. In June a specimen was recorded from St. Andrews parish, and in July a number were received from the south coast (see also *Agricultural News*, Vol. XIII, p. 250).

INSECT PESTS OF MISCELLANEOUS CROPS.

Under this heading reference is made to the occurrence of the red spider of sweet potatoes (*Tetranychus telarius*), the corn ear worm (*Laphygma frugiperda*), and a new species of scale insect on cassava.

H.A.B.

CATERPILLARS ATTACKING SUGAR-CANE.

In the Items of Departmental Interest from St. Lucia, for June last, mention is made of an attack of caterpillars on sugar-cane on one estate in that island. The worm was believed to be the corn ear worm (*Laphygma frugiperda*), and the attack was successfully controlled by the use of Paris green.

Such attacks on sugar-cane are not frequent in the West Indies, although in British Guiana and Trinidad there are several caterpillars which are known to feed on the leaves of sugar-cane. One of these is the grass worm (*Mocis* [Remigia] *repanda*), which formed the subject of Insect Notes in a recent issue of the *Agricultural News* (June 5, 1915).

A few years ago an attack of caterpillars was recorded on young sugar-cane plants on one estate in Antigua. It was suspected that these insects bred in the grass and bush growing on adjacent lands, and that they invaded the cane-fields after the original food became scarce. It may be that the grass worm, or even the corn ear worm, might have been responsible for this attack.

Paris green dusted on to the cane plants in the same manner as when used on cotton ought to provide a satisfactory means of checking such outbreaks.

WEED DESTRUCTION.

THE BLOW LAMP FOR KILLING WEEDS.

In the *Agricultnral News* for November 21 last, (see Volume XIII, p. 375) a brief abstract was given of an article which had appeared in the *Journal of the Royal Horticultural Society*. The abstract was entitled Explosives and the Blow Lamp in the Garden.

Among the uses to which the blow lamp had been put by the writer of the original article was the killing of weeds in drives and paths.

In order to test the value of this method of weed killing, trials have been made at the headquarters of the Imperial Department of Agriculture in Barbados, using a medium sized blow lamp burning kerosene; it has been found that the weeds which commonly occur in these drives are not satisfactorily killed by this means. In the first place, the weeds are too deep-rooted; and secondly, some of them are so fleshy and succulent as to require an undue amount of time and fuel to scorch them. It may be added that this trial was made on an old drive, that is to say, grass and weeds were well established, and they keep reappearing in spite of the use of the blow lamp and of frequent weedings with the hoe. Possibly in the case of a drive newly laid down and freshly marled, the blow lamp would be more effective, as it would, if properly used, have to deal only with very young weeds which had not yet got established. It is possible, therefore, that there are situations and conditions in which this method of controlling weeds may be of service.

ERADICATING WEEDS WITH MANURE.

The article on turf, which appeared in the *Agricultural News* for January 30 of this year, gave directions for improving lawns, in which the principal grass was devil's grass (*Cynodon dactylon*), by means of an overdose of ammonium sulphate.

This method has now been tried on a tennis lawn in Barbados with excellent results. The tennis lawn had formerly been well covered with devil's grass, but a very considerable mixture of weeds had come into it, especially noticeable being the so-called duckweed (*Synedrella nodiflora*), several small leguminous plants, and nut grass (*Cyperus rotundus*). These were so abundant that the lawn had to be weeded before the application of ammonium sulphate was made.

The rate of application recommended was $3\frac{1}{2}$ lb. of ammonium sulphate in 4 gallons of water per 100 square feet. The application was made at this rate, using for the purpose a watering pot with a moderately fine rose nozzle, and light showers fell almost daily for a short time after. As a result the lawn has greatly improved, the weeds having quite disappeared leaving an almost pure growth of devil's grass, except for some nut grass. This last is too deeply rooted to be affected by the action of the sulphate of ammonium, but as this grass, or sedge, does not form patches, and is easily cut by the lawn mower, it is of but little consequence.

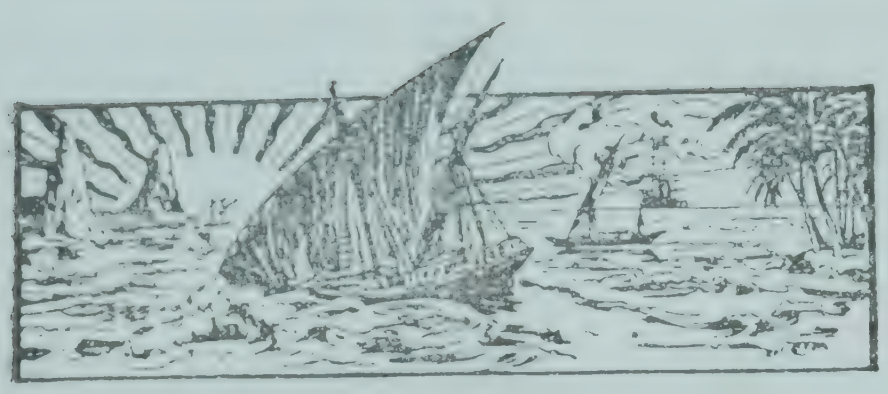
In order to check the effect of weeding, an adjoining portion of turf was treated with the ammonium sulphate without being first weeded, and another patch was weeded but did not get any application of the sulphate. In both these instances improvement as to the prevalence of weeds was noted, but neither of them made the improvement that was to be seen in the tennis lawn. The plot which was not weeded and received the application of ammonium sulphate was the better of these two, the results more nearly approaching those yielded by the tennis lawn itself.

Ankylostomiasis in Grenada.—In connexion with the editorial on the subject of hook worm disease in the tropics, which appeared in a recent issue of the *Agricultural News*, it may be well to call attention to an instructive paper read by Dr. McDonald at a meeting of the British Medical Association (Sectional Branch), Grenada. The paper is entitled The Disposal of Human Excreta in the Tropics. On account of the importance of this matter in regard to hook worm disease, a considerable amount of detail is given as to the best methods of disposal and deodorization. Briefly the customary methods of disposal throughout the tropics are: (1) water carriage, (2) human carriage, (3) original permanent disposal, and (4) natural disposal. All these are dealt with and criticised at considerable length. The most important point, however, raised by Dr. McDonald, is the great value of salt. Under ordinary circumstances the best deodorant and disinfectant, is dry earth, but where ankylostomiasis is common, salt mixed with dry earth or sand is a safer disinfectant and a good deodorant. Salt has the added advantage of killing the hook worm. It also helps to keep away flies. Its more extended use for the purpose in question is strongly advised.

Conservation of Soil Moisture.—By the application of compost covers, the soil remains soft, moist and cool during the dry season when uncovered soil becomes cracked and baked. By this method of covering the soil, obnoxious weeds are suppressed. When the object of tillage is the improvement of the physical condition of the soil, the saving of moisture and destruction of weeds, compost covers such as are here used may be substituted for tillage operations. They conserve the water content of the soil so much that in the dry season at least compost covers are a necessity in the best farm management, especially in the case of shrubs, trees, and certain truck crops. The best locally available cover in regard to conserving moisture in the soil is banana leaf cover to a depth of 30 cm., which in our experiments stored in 222 days, 25·89 per cent. of the water, which is equivalent to 7·87 cm. of rainfall, or 787 tons per hectare. Soil covered with weeds loses much more moisture than that which is uncultivated, and bare. The percentage of moisture in soils is greater at a depth of 30 cm. than at 15 cm. (The *Philippine Agriculturist and Forester*, May 1915.)

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on August 13, by the C.R.M.S. 'Chignecto' for the purpose of making an official visit to Grenada. Dr. Watts is expected to return to Barbados by the same steamer on August 24.



GLEANINGS.

From information received, it is understood that the sum of £18 17*s.* 4*d.* has been collected from the members of the Antigua Agricultural and Commercial Society as a contribution towards the Overseas Aircraft Fund.

It is stated in the *Chamber of Commerce Journal* (July 1915) that the 85th meeting of the British Association for the Advancement of Science will be held in Manchester from September 7 to 11, under the Presidency of Professor Arthur Schuster.

Some remarkable records were made at the 1914-15 egg-laying competition conducted by the Government of Victoria, Australia. Fed on dry mash diet, six white leghorns laid 1,699 eggs in one year, which at 1*s.* 2*d.* per dozen would be worth £8 5*s.* 2*d.*

An article appears in the *Natal Mercury* for May 27, 1915, which describes a new sugar mill which is being erected in that province of South Africa next to the main North Coast railway line. It appears to be of very modern construction, for the chimney is comparatively small, induced draught plants having been installed. Provision has also been made for the manufacture of white sugar.

It is stated in the *Journal of the Chemical Society*, Vols. 107 and 108, p. 846, that the action of colchicine from *Gloriosa superba*, well known in the West Indies, was compared with that of the base from *Colchicum autumnale* and the two bases were found to be identical in their effects. It is evident, says the journal, that the toxic properties of *Gloriosa superba* are due to the colchicum present.

A useful publication is *Bulletin No. 127*, University of Florida, Agricultural Experiment Station, which contains a large amount of information concerning the different groups of mangoes. On the cover is an illustration showing the correct way to peel a fibrous mango. A circular incision is made at each end, and then longitudinal cuts are made and each section peeled off between the point of the knife and the thumb.

According to a note in the *Experiment Station Record* for June 1915, calcium compounds, particularly as sulphate or as phosphate, exercise a most important influence on forest vegetation. It is stated that certain trees were found to grow with increased vigour in the presence of high proportions of the salts mentioned. It is believed that the influence of the salts is in the nature of stimulation rather than of nutrition.

Reference is made in *Bulletin No. 190*, United States Department of Agriculture, to the importance of draining irrigated lands, and attention is called to the alarming proportion of lands that have been brought under irrigation which are now unproductive by reason of water-logging and alkali. The reclamation of these lands can easily and economically be effected by drainage, followed by proper cultivation, cropping and irrigation.

Dr. Britton, who visited the Virgin Islands a few years ago, contributes to the *Journal of the New York Botanical Gardens* an interesting communication on a further botanical exploration of Porto Rico. In the course of his report Dr. Britton says that excepting the Luquillo Mountain Forest Reserve in eastern Porto Rico, there is now very little forest remaining on the island, and for the future welfare of the colony it is imperative that a policy of conservation and reafforestation be adopted.

Appearing in *Modern Cuba* is a series of articles on the economic flora of that island. The article in the issue for June 1915 gives lists, in some cases not complete, of the plants yielding commercial timber, tannin, oil seeds and nuts, and fibres. Amongst the latter class is an agave, a hibiscus, and several other plants familiar in these islands. It is said that the cultivation of cotton in Cuba will never prove a success until it has been found possible to control the boll weevil.

According to the *Produce Markets' Review* for July 10, 1915, a very strong demand continues in England for beans and peas. For split peas there is a large business in forward positions, and prices are likely to be higher as the season advances. Split lentils are in excellent demand for this time of year, and prices are very firm. Rangoon beans are in good demand and shippers ask an advance of 10*s.* per ton. It is possible that prices will rise considerably on the approach of the season. Madagascar butter beans are a shade firmer and an early advance may be expected.

The Ninth Announcement of the McDonald College of McGill University contains interesting information as to the ways in which a school of agriculture may render useful services to farmers living in the neighbourhood. The different departments of the college, which include engineering, animal husbandry, bacteriology, biology, cereals, chemistry, dairy, horticulture, etc., are prepared to furnish information on questions pertaining to each department, respectively. Personal interviews are invited, and free winter short courses are provided for those farmers who care to attend.

Correlating Agriculture with the Public School Subjects in the Southern States, is the title of *Bulletin No. 152* of the United States Department of Agriculture. This publication contains much that is suggestive, especially the set of score-cards which are inserted towards the end. These not only include systems of scoring for live-stock, and plants like cotton and corn with which we are familiar in the West Indies, but also score-cards for products like butter, preserves, vegetables and fruit. The score-card is of much value in agricultural education, and those interested in the subject should give this publication their attention.

SCIENTIFIC AGRICULTURE IN BENGAL.

Perhaps no province in India is more suitable in every respect for agricultural experiment and research than Bengal, with its great variety of soils, its damp, hot climate, and its rich deltaic areas. The annual reports of the expert officers of the Bengal Department of Agriculture for the year ending June 30, 1914, testify to this. The chief points are summarized in the *Pioneer Mail*. Three of the most important crops of India are rice, jute, and sugar-cane. All of these flourish in Bengal, and have throughout the year been made the subject of special study by the economic botanist, the fibre expert, the agricultural chemists, and the Imperial mycologist. In view of the great progress made in recent years in the development of the Agricultural Department, it is curious to recollect that a short decade ago none of the provinces had an Agricultural Department at all. It was in 1904 that Lord Curzon, with the help of Sir Denzil Ibbetson, took up the question of the thorough reorganization of the department for the whole of India, which resulted in the establishment of the Imperial Agricultural College and Research Institute of Pusa, and later on, of special departments and colleges for the Provinces. How necessary this action was, the result has proved. Already great benefits have accrued to agriculture, and the opportunities of the future seem almost inexhaustible.

In Bengal there is a system of agricultural stations or demonstration farms, each farm being under a special superintendent of its own, where important experiments are carried out under adequate supervision. It is at these agricultural stations that the fibre expert, the agricultural chemist, and the economic botanist are able to test the theories of the laboratory. There are now agricultural stations or farms at Dacca, Chinsura, Rajshahi, Burirhat, Rangpur, Burdwan, Kalimpong, and Chittagong; so that practically all the divisions of Bengal are represented.

The fibre expert has his headquarters at Dacca, the centre of the flourishing jute trade of Eastern Bengal. Very interesting experiments have been made with regard to manures for jute on red acid soils in Bengal. These manurial experiments were begun in 1911, and the results now obtained confirm those of the previous years in a very convincing manner. The lime applied in 1912 gave an increase of 4 maunds per acre of fibre over the unlimed plots; and in 1913 the same plots without any further application of lime yielded nearly 5 maunds per acre more fibre than the unlimed ones. This shows the great value of lime as a manure on such soils. In addition to this, the fibre expert Mr. Meggitt, is investigating the effects of various forms of phosphoric acid on both limed and unlimed land: 'There seems to be no doubt that the action of phosphates benefits jute to a considerable extent; and there is at least some indication that their application actually tends to increase the percentage fibre content of the plant—a most important matter. There are also indications of their action in other directions; but further work is required, not only on these points, but also as regards the form of phosphates whose application is most advantageous.' How important these investigations are likely to be in their effect upon the production of jute may be gauged by the fact that in three years an aggregate expenditure of Rs. 47 per acre on lime and bone has increased the aggregate yield of jute and mustard on the Dacca plots to the value of no less than Rs. 144, representing an increased net return of Rs. 97 per acre. If a more extensive test corroborates the truth of these inferences, the fibre expert will have great cause for congratulation on the results.

Turning to the report of the economic botanist, Mr. G. P. Hector, we find that special attention was paid to the main food crop of Bengal, namely rice. The Ufra paddy disease is very common in Bengal, and very deadly in its effects on the rice crop. Experiments have been made to test the effect of thorough ploughing and stubble-burning during the cold dry months, and these experiments are being carried on in consultation with Dr. Butler, the Pusa expert. There is good ground for hope that they may supply a remedy for Ufra disease, and it is proposed to extend the tests at Comilla under as careful control as possible. With regard to sugar-cane, some valuable work has been done by Mr. Annett, Agricultural Chemist to the Government of Bengal. Five varieties of sugar-cane were tried on the Dacca farm with the object of finding out the most suitable varieties for distribution to cultivators. The results obtained show that the method of sampling recommended by Dr. Leather, Imperial Agricultural Chemist, gives extremely happy results. This method will be followed in future years, and will result in much saving of time in the chemical control of sugar-cane experiments. (*Journal of the Royal Society of Arts*, July 9, 1915.)

Egret and Heron Rearing in Madagascar.—An article in the *Bulletin Economique de Madagascar* gives an account of the domestication of herons and egrets in that island, whereby it has been found possible to obtain the plumage of these birds without any of that horrible cruelty which has come to be associated with the plume hunters. In the Vohemar Province egrets and herons are reared and tamed by the natives, who keep them merely as pets and without an eye to profit. They are turned out by day to seek their food in the marshes or from the ticks and parasites of the cattle, and return home to roost at night. The plumes begin to appear when the bird is about six months old, but they should not be taken until it is sixteen months, or perhaps not until it has produced its first brood. They are finest at breeding-time, and are cast after this to appear next year. They should be taken by cutting near the base, and the stumps should be removed later, when they have dried up. The time to cut them is when the young begin to leave the nest and feed themselves. The article contains information as to the treatment and feeding of the birds. There are considerable difficulties in managing them—for one thing, strange birds are apt to fight furiously with one another, even to the death—but the plumage, if in good condition, is so valuable that it might well pay to start the domestication of the birds on a considerable scale (*Journal of the Royal Society of Arts*, for June 18, 1915.)

It is proposed to create a Central Agricultural Bureau in Queensland, and to encourage the founding of branches. The objects of the bureau will be, among other things, to gather information respecting plants, animals, and products likely to prove useful, to collect and publish such information as would be of value to persons engaged in the various barnches of agriculture, and generally to raise the social and educational status of the man on the land and his family. Bureaus, such as indicated, will be immensely helpful and advantageous to the distribution and cultivation now of wheat and maize, as also in the working and recording of experiments in dry areas.

FUNGUS NOTES.

LIME AS A FACTOR IN RESISTANCE TO DISEASE.

Considerations of interest in their general bearing on the question of resistance to plant diseases are raised in a paper by Mr. J. K. Ramsbottom, appearing in the *Journal of the Royal Horticultural Society*, Vol. XI, p. 481. The subject is the leaf blotch disease of some species of Iris, caused by the fungus *Heterosporium gracile*, Sacc.

The affection appears in spring on the young leaves and attains serious proportions in late summer and autumn. The premature death of the leaves weakens the plants as a whole, so that if unchecked the disease may bring about their death.

Mr. F. J. Chittenden reports as follows on the effects of treatments applied at the Royal Horticultural Society's Gardens at Wisley. Spraying with copper fungicides resulted in the disease being checked to some extent, but it broke out with equal virulence in the succeeding year. Spraying every three weeks was then resorted to, but did not effect a cure. In the following winter a different method was adopted. After the dead foliage had been removed, the ground was heavily dressed with slaked lime. The result surpassed expectations. The growth came away clean and healthy in the spring, and remained so throughout the season. An occasional winter dressing of lime has been given, and extremely little of the fungus has been seen since.

The idea underlying the application of lime was the usual one, namely, that it would encourage the oxidation of organic matter in the soil upon which the fungus conceivably maintained itself through the winter, and that by neutralizing soil acidity it would render the conditions less favourable for the growth of the fungus.

Some notes by Mr. W. R. Dykes, the well-known authority on the genus Iris, suggest another interpretation of the result obtained. Certain groups of Iris prefer a limestone soil, others a soil free from lime. According to his observations the disease does not occur on the lime-hating species, and only on the lime-loving species when grown on a soil which is deficient in that substance.

As the author of the paper suggests, the facts are too few to bear the weight of any theory as to their significance, but they indicate the possibility of obtaining definite information of a kind that is much needed for the progress of economic mycology. It is to be hoped that the matter will be pressed to a conclusion.

SUCCESSFUL SPRAYING OF PALM TREES IN INDIA.

A disease of areca palms known as *koleroga* and caused by a variety of the fungus *Phytophthora omnivora* has been under observation in Mysore for some years. An account of an investigation by Dr. L. C. Coleman appeared in the *Agricultural News*, June 24, 1911 (Vol. X, p. 206). In the *Agricultural Journal of India* for April 1915 (Vol. X, p. 129), Dr. Coleman gives an interesting report on the extent to which control measures have been adopted and the results obtained. The author makes a remark with regard to India which might with justice be given a wider application, namely that 'in comparatively few instances has the control of plant diseases been carried out methodically and successfully, and still more rarely has it been taken up to any considerable extent by the agriculturists themselves.' Hence the interest of the account under review.

The principal area in which the disease occurs is a strip about 100 miles long, and from 20 to 30 miles broad along the extreme western edge of the Mysore plateau. Practically the only important crops are paddy and areca nut. The gardens in which the palms are cultivated occupy the sides of the valleys and the higher portions of their troughs, and frequently extend for miles in a practically continuous range. The gardens are mostly owned and cultivated by Brahmins, who are sufficiently educated to be approachable by means of printed matter. The return from a well cultivated garden is in good years 500 to 600 rupees per acre.

The method of treatment recommended is the spraying of the bunches of nuts with Bordeaux mixture before the disease appears. The chief difficulties to be faced are the heavy rainfall of the monsoon, reaching in some places to 20 inches in one day and 140 inches in one month; the remoteness of the gardens from the main roads, and the physical difficulties of spraying the tops of slender trees 60 to 80 feet high. The author is probably justified in thinking that in no other part of the world has the scientific control of a disease been attempted where the initial difficulties have been so great.

The washing away of the sprayed deposit by the torrential rains was prevented by using Bordeaux mixture of double strength, to which was added a resin soap made by heating together resin and soda in water. In most cases one application was found to be sufficient to protect the nuts during the critical period. The method of application first tried involved the use of a line of hose carried up the tree by a climber, the fluid being pumped up from a barrel on the ground. This was found to be both awkward and dangerous, and the solution of the difficulty was found in the use of compressed air sprayers, holding rather less than a gallon, and capable of being easily carried up a tree. Such machines have withstood six years of rough usage.

After three years of experimental demonstrations carried out at the expense of the Government it was decided to offer sprayers for sale. In the three years 1912-14, the numbers disposed of were 31, 36, and 110, respectively, showing that the 'extremely sceptical garden owners' were favourably impressed by the results obtained. The Agricultural Department has placed stocks of the ingredients used in preparing the spray mixture for sale at convenient centres, and the demand has been such, that during the past year over $6\frac{1}{2}$ tons of material has been stocked. Over 100 owners are carrying out spraying quite independently of any assistance from the Department, and not far from 600 acres must have been sprayed during the past year, as against less than 200 acres the previous year and about $\frac{1}{2}$-acre six years ago. One leading garden owner estimates that the spraying of his garden of 12 acres has during three years saved him 4,000 rupees.

There is some hope of stamping out the disease entirely, or at least from isolated tracts, if the co-operation of the owners can be secured, and experiments to learn what justification there is for such hope are in progress. One garden has been kept entirely free for three years, and will now be left alone so as to ascertain whether the disease will reappear.

The report is a valuable record of difficulties faced and overcome.

W.N.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of June:—

June, even in normal times, is always the slackest month of the year in the Mincing Lane markets, when the summer holidays are in full swing. But though the war has absorbed almost every other thought, holidays at the time of writing are being taken, though in a much more subdued fashion than usual. A fair amount of business has been carried through at the weekly auctions during the month, in produce generally, mostly with an upward tendency with regard to prices—a remark that applies equally to West Indian products as to those of other countries.

GINGER.

At the first auction on the 2nd of the month, 662 packages of Cochin and Calicut were offered, and a large portion disposed of, medium and small washed rough Cochin fetching 30*s.* per cwt., and small lean brown Calicut 28*s.* There was no Jamaica offered at this sale, but a fortnight later, namely on the 23rd, some 51 packages of new season Jamaica were offered and partly sold, bold plump dull washed fetching 75*s.*, and medium to bold dull washed 64*s.* to 65*s.* It was the expert opinion that this new crop Jamaica was of better quality than has been the case for some time past.

In nutmegs and mace the market has been very quiet.

SARSAPARILLA.

At auction on the 10th of the month sarsaparilla was in good supply as follows: Grey Jamaica, 44 packages; native Jamaica, 6 packages; Lima-Jamaica, 9; Honduras, 23; and Mexican, 19. Of the first, 34 bales were disposed of at 1*s.* 11*d.* per ℔. The 6 bales of native Jamaica sold at 1*s.* for pale red, 1*s.* 1*d.* for dullish, and 1*s.* 2*d.* for fair to good red. None of the Honduras was sold, 1*s.* 4*d.* to 1*s.* 10*d.* per ℔. being asked for it. The Lima-Jamaica also failed to find a purchaser, and 11 bales only of the Mexican were sold, fetching 9¼*d.* per ℔.

CITRIC ACID, LIME JUICE, LIME OIL, KOLA, ANNATTO, AND CASSIA FISTULA.

At the beginning of the month citric acid had advanced 1½*d.* per ℔. on previous rates, 2*s.* 7½*d.* being the lowest quotation. A week later it advanced to 2*s.* 8*d.*, in the third week to 2*s.* 9*d.*, and at the end of the month to 2*s.* 10*d.*; and it was confidently stated that good concentrated juice would in future not be obtainable at less than 3*s.* At the beginning of the month it was stated that there was practically no lime juice in the market, but at auction on the 16th a good amount of business was done in good raw West Indian juice at 3*s.* 6*d.* per gallon. West Indian distilled lime oil, in the early part of the month was reported as fetching 4*s.* 9*d.* per ℔. retail, but a fortnight later 5*s.* 6*d.* was the price quoted in the market, and 7*s.* 3*d.* for hand pressed. Quite at the end of the month as much as 6*s.* was asked for distilled oil, and 8*s.* for expressed: the new crop West Indian oil was being anticipated with interest. Kola was represented at auction on the 10th by 14 packages, only 4 of which found buyers at 3*d.* per ℔. for dull, part wormy. For the remaining 10 packages of good bright halves 5*d.* per ℔. was asked. Annatto seed to the extent of 102 packages of good Madras were brought forward at auction on the 20th, but were all bought in at 8*d.* per ℔. A week later, however, they were obtainable at 7*d.* At the beginning of the month good West Indian pods of Cassia Fistula were offered at 32*s.* 6d. per cwt., but failed to find buyers.

COMMERCIAL NOTES ON CACAO AND RUBBER.

The following notes on West Indian cacao and Malayan rubber appeared in the *Colonial Journal* for July 1915, and are reproduced here for the benefit of our readers:—

CACAO. The quality of Trinidad cacao is excellent, and the price is generally a few shillings over other West Indian cacaos. But the difference of price has not recently been so great as it used to be, and complaints have been made that the cacao is 'clayed'. Clay has a wonderful preservative effect, and on this account the old Spanish planters always used it; it gives a good aroma to the cacao when the bean is broken. If properly used the coating is so fine as to be almost imperceptible. Clay may be used to increase the weight or to disguise the want of proper curing, but a proper application improves the appearance and is therefore favoured. Excessive claying in Trinidad has now been stopped.

One thing that militates against first-class cacao is that the chocolate business takes up a large supply, and a cheap cacao is nearly as good for this purpose. Indeed the Trinidad cacao sent to be made up into chocolate for soldiers was too good to make an acceptable chocolate, and the manufacturers advised the mixture of an inferior variety.

RUBBER. The future of rubber companies depends on the cost of production, and a great reduction has been effected and is still going on. Thus the Consolidated Malay Rubber Estates have brought down the figure from 1*s.* 10*d.* in 1912 to 1*s.* 2·46*d.* in 1914, and with largely increasing crops they expect to touch 1*s.*

The system of permitting shipments of rubber to America under guarantees has given great relief to plantations, as it has been largely used. The concession was in the interest not merely of the growers, but also of the military authorities. Rubber enters into industries so variously that a shortage in America would have seriously hampered the production of the munitions of war intended for this country. The accumulated stock will not have gone very far in face of the great demands; and the requirements will be so vast if the war is long prolonged that the industry is likely to enjoy a prosperity that will make amends for long depression.

MARKET REPORTS.

London.—The West India Committee Circular, July 13, 1915.

Arrowroot—2¼*d.* to 4¾*d.*
Balata—No quotations.
Beeswax—No quotations.
Cacao—Trinidad, 80/- to 82/- per cwt.; Grenada, 65/- to 80/-; Jamaica, 70/-.
Coffee—Jamaica, no quotations.
Copra—No quotations.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 57/- to 75/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/8 to 3,9; concentrated, £25; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—9*d.* to 2/11*d.*
Nutmegs—4¼*d.* to 5¾*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 2/7; fine soft, 2/3; Castilloa, 1/10.
Rum—Jamaica, 3/6.

New York.—Messrs. Gillespie Bros., & Co., July 15, 1915.

Cacao—Caracas, 15½c. to 16c.; Grenada, 16½c. to 16¾c.; Trinidad, 16½c. to 18c.; Jamaica, 14½c. to 15½c.
Coco-nuts—Jamaica and Trinidad selects, $24·00 to $26·00; culls, $14·00 to $15·00.
Coffee—Jamaica, 7¾c. to 11c. per ℔.
Ginger—12½c. to 16c. per ℔.
Goat Skins—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 38c. to 40c. per ℔.
Grape Fruit—Jamaica, $2·00 to $2·50.
Limes.—$3·50 to $4·00.
Mace—47c. to 51c. per ℔.
Nutmegs—11c. to 11½c.
Oranges—Jamaica, $1·75 to $2·00.
Pimento—3½c. per ℔.
Sugar—Centrifugals, 96°, 4·83c.; Muscovados, 89°, 4·18c. to 4·21c,; Molasses, 89°, 4·05c. to 4·08c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., July 26, 1915.

Cacao—Venezuelan, $16·50; Trinidad, $16·60 to $17·15.
Coco-nut Oil—86c. per Imperial gallon.
Coffee—Venezuelan, 12c. to 13c. per ℔.
Copra—$3·75 per 100 ℔.
Dhal—No quotations.
Onions—$1·20 to $2·00 per 100 ℔.
Peas, Split—$12·00 per bag.
Potatoes—English $2·25 to $2·50 per 100 ℔.
Rice—Yellow, $6·00 to $6·25; White, $5·50 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. T. S. Garraway & Co., July 26, 1915.

Arrowroot—$4·00 to $4·50 per 100 ℔.
Cacao—$14·00 to $14·50 per 100 ℔.
Coco-nuts—$16·00.
Hay—$1·90 per 100 ℔.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia $85·00 per ton.
Molasses—No quotations.
Onions—$3·00 to $4·25 per 190 ℔.
Peas, Split—no quotations; Canada, $5·40.
Potatoes—Nova Scotia, $3·25 per 160 ℔.
Rice—Ballam, $6·00 to $6·10 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, no quotations.

British Guiana.—Messrs. Wieting & Richter, July 24, 1915; Messrs. Sandbach, Parker & Co., July 23, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$10·00
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	14c. to 15c. per ℔.	16c. per ℔.
Cassava—	$1·44	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	——	14c. per ℔.
Jamaica and Rio	14c. to 15c. per ℔.	14½c to 15c.
Liberian	10c. per ℔.	10c. per ℔.
Dhal—	$8·00	——
Green Dhal	——	——
Eddoes—	$1·68 to $3·00	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	4c. per ℔.
Madeira	3¾c.	——
Peas—Split	$12·00 to $12·50	$13·00 to $14·00 per bag. (210 ℔.)
Marseilles	——	——
Plantains—	20c. to 48c.	——
Potatoes—Nova Scotia	$4·00	$4·00 to $4·50
Lisbon	——	——
Potatoes--Sweet, B'bados	$1·44	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
Tannias—	$2·40	——
Yams—White	——	——
Buck	——	——
Sugar—Dark crystals	$3·75 to $3·85	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

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Storm-Damaged Crops.

THE high winds that have recently been experienced in many of the West Indian islands, and the circumstance that the hurricane season is not yet over, render opportune a consideration of the damage sometimes inflicted on certain crops by wind, and the ways and means of repairing the injury as far as is practicable.

Speaking generally, most tropical plants are not well adapted to withstand winds. Cacao, bananas, rubber, cotton and limes are notable examples. The coco-nut is an exception. Because of this general rule, much importance is attached to the selection of sheltered localities, and to the provision of wind-breaks, but even where these conditions are secured they are of little avail in the event of a heavy gale or hurricane. As would be expected, the perennial or orchard crops fare worst, and the damage is naturally of a very serious nature owing to the comparatively long time it takes to re-establish these cultivations.

Jamaica is a West Indian colony which has from time to time suffered great losses from the widespread destruction of banana trees. In advising the repair of the damage done on these occasions the Agricultural Society suggests that old fields of bananas on large estates should be cut down knee high and fresh suckers planted in between. For the small holder, who requires bananas for food and not for export, it is best to leave the battered trees as they are, for even if they give rise only to small bunches of fruit, these will be valuable for food, even though they are useless for export. Peas and beans (but not sweet potatoes and pumpkins) should be placed in between the rows. The sweet potato is a useful emergency crop to be grown by itself, and in the hurricane season supplies of cuttings should be kept available for distribution. That is to say, plants should be kept available, for a sweet potato cutting itself will not keep longer than about three days. Of all crops which appear to resist storms most in Jamaica is the coco (*Colocasia antiquorum*), but after a storm the small holder cannot do better than plant peas and beans, for these plants are quick growers, soil-enriching, and the most nutritious of all vegetable foodstuffs.

Lime trees—the cultivation of which is associated principally with Dominica -are often damaged by wind. When these trees are loosened in the soil by wind or blown over, very sound judgment is required, otherwise a good deal of time and money may be wasted in attempts to raise and prop trees which can never again obtain a firm hold on the soil. Such trees that are loosened and lie over at an angle, should be promptly brought back to an upright position and supported by props. With trees that are lying on the ground, the planter's attitude should be a waiting one. The trees whose roots still have a firm hold of the soil will in the course of a few weeks send out vigorous shoots near to the base of the trunk. In the course of a few months when the shoots have attained a considerable height, it will be time to remove the branches of the original tree which are touching the ground. Thus in a comparatively short time the tree is renovated. The fallen trees with roots badly displaced make but feeble efforts to grow, and these are best utilized for cord-wood, and their places filled with healthy seedlings.

Turning to a consideration of the cacao crop it is worthy of note in the present connexion that colonies containing the largest areas under this cultivation, namely, Trinidad and Grenada, do not lie in the track of gales and hurricanes. Nevertheless cacao is very susceptible even to comparatively light winds, and where branches get broken the limbs should be carefully pruned and treated with resin-petroleum or some other form of wound-dressing. This treatment applies generally to all arboraceous crops and not only to cacao.

The cases of sugar-cane and cotton in regard to storm damage are by nature of a different order. Sugar-cane, unless the storm is very intense, seldom gets more than 'laid' and will continue to grow, although later on its procumbent position must increase the cost of harvesting. Much depends upon the ripeness of the crops at the time of the disturbance. The later the storm the greater the damage. With cotton the effects are often more disastrous. A strong wind will defoliate the plants while a gale or hurricane may mean complete destruction. In cases where the trees get blown over at a time when the soil is in a saturated condition, it may be possible to press the roots back into position by means of the feet, but with all crops where there has been a serious rupture at the root centre there is very little hope of satisfactory recovery.

In conclusion it will be evident in a general way that the greater part of the damage inflicted on crops by hurricanes is irreparable, though by no means entirely so. To lessen the financial loss caused by occasional disasters the planter will in many cases no doubt have had recourse to a scheme of insurance.

SUGAR INDUSTRY.

CUBAN SUGAR FACTORY RESULTS.

A good deal of attention is given in a recent issue of the *Louisiana Planter* (July 31, 1915) to progress in the Cuban sugar industry. One article compares the sugar factory results in Cuba and Java, from which the following is extracted:—

'A study of the table shows that the various factories considered by Mr. Hall, by their own analytical work demonstrated that the sucrose content of the canes in Cuba for the crop of 1915 reached 13·08 per cent., as against Java 11·91 per cent. for 1914, and 12·71 for 1911. From the canes Cuba extracted 11·78 per cent. of sugar against Java's 10·77 and 11·52 per cent. for the two years, respectively.

'In the third item, the careful working of the Dutch sugar planters in Java shows a slight gain on their part. The data given show the Cuban cane to contain the most sucrose, but of the sucrose contained in the cane the Cubans secured but 90·07 per cent., while Java secured 90·43 and 90·60 per cent. for the two years, respectively.

'Another item of some importance, especially from a fuel point of view, is the fact that the fibre in the Cuban canes is slightly under 11 per cent., or to be more exact, is 10·86 per cent., while Java reports 12·61 and 12·32 per cent.

'The direct extraction by the mill of the contained juice in Cuba is rated at 76·61 per cent. and the sugar lost in the bagasse based upon the weight of the sugar-cane is estimated at 1·29 per cent. in Cuba and at 1·14 and 1·19 per cent. in Java, thus indicating the final loss of sugar in the bagasse as slightly less in Java than in Cuba. On the other hand, the loss of sugar in the filter press cake is rated in Cuba at 0·08 per cent. as against 0·13 per cent. and 0·10 per cent. in Java.

'Now comes a striking feature as to the density of the juice which in Cuba registers 19·06, against Java 15·76 and 16·01 per cent. total solids. Again, a single polarization of the juice stands for Cuba at 16·27 and for Java at 12·67 and 13·54; a very striking difference, which leads us to wonder whether the Java figures of polarization for those years are correct, or whether or not the Cuban figures apply to undiluted juices and the Java figures to juices that are diluted. The purity of the Cuban juices is reported at 85·36, against Java's 80·39 and 84·57 per cent., a notable difference in favour of Cuba.'

In spite of the foregoing, the *Louisiana Planter* advocates in an editorial the need for more organized experiment station work in Cuba for the good of the industry as a whole.

'The Cuban Government ought to be in a position to spend at least $100,000 a year in experiment station work in connexion with its sugar industry. There is no venture that the Cuban Government could make that would so quickly bring ample remuneration for any sacrifice that the Government might make to carry on this great educa-

tional work.' Contrasting the position of Cuba with that of Louisiana, Java and other places, it is clearly shown that Cuba is far behind other cane-growing countries as regards experimental work. In conclusion it is urged: 'let Cuba educate her sons up to the highest possible standard of technical excellence in every branch of their industry and they will find that they have chosen the proper road to better fortunes than have hitherto been realized by them.'

POSSIBLE EXTENSION OF SUGAR CULTIVATION IN TRINIDAD.

As a result of an enquiry on the above subject from the West India Committee similar to those reported in the *Agricultural News* for August 14, 1915, the Board of Agriculture, Trinidad, recently appointed a committee whose object was to be the collection of information as to the possibilities before an increase in the amount of sugar produced in the colony. It appears from the facts collected that in Trinidad there are 42,514 acres in sugar cultivation and 30,981 regarded as available for sugar. As the result of the consideration of the replies received by the committee, that body is of opinion that no material extension of the sugar industry is to be expected under present conditions, and that a continuation of immigration on the scale of the last few years is necessary for the maintenance of the present normal output.

'The committee is also of opinion that apart from the question of labour the dominant factor in any possible increase of the industry is the working capacity of the factories. To increase this and to provide additional encouragement for cane farmers, fresh capital is absolutely necessary. This would not be forthcoming without a guarantee that the market price of sugar would be higher than during recent years. The only way in which this guarantee could be secured appears to the committee to be that a preference should be given by the Imperial Government to sugar produced in the British Empire.'

It may be noted in conclusion that the output of sugar from Trinidad has steadily fallen during the period 1895 to 1913. In 1912 and 1913 the reduction was due largely to drought and froghopper attacks; in 1914 with more normal climatic conditions and diminution in pests there was a marked recovery. Finally an important factor which must be taken into account in considering the reduction is that other and more profitable crops have been substituted for canes. Coco-nuts, and to a less degree limes and cacao are being planted on former sugar estates on some of which canes are still cultivated as a subsidiary crop.

Sugar-cane wax.—The following note which appears in the *International Sugar Journal* for July 1915 is likely to be of some interest owing to the fact that attention has been given to the extraction of wax in Barbados and other places locally:—

'Cane wax, which occurs on the surface of the cane stalk, is a wax of valuable properties, which could be substituted for carnauba wax in some of its applications.

'No practically successful method has yet been devised for the mechanical separation of the wax from the stalk.

'The crude wax obtained from filter-press cake by extracting with organic solvents is very impure, containing fats and oils as well as the cane wax itself, and therefore is much softer and of lower melting point than pure cane wax. The extraction and disposal of this crude wax would probably be unprofitable

'Pure cane wax can be obtained from the crude wax extracted from press cake by fractional crystallization from benzine, but only a relatively small yield is obtained.

'Pure cane wax is best obtained from the raw juice by centrifugal action, the crude product being purified by recrystallization from denatured alcohol.'

THE RESOURCES OF GERMAN SOUTH WEST AFRICA.

More than usual interest centres around the German possession in South West Africa owing to the fact that this territory, which has an area of about 322,450 square miles, is now occupied by the troops of the Union of South Africa. The subject of the economic resources of the colony is dealt with in a very comprehensive manner in the current issue of the *Bulletin of the Imperial Institute*. Primarily the wealth of German South West Africa lies in its minerals. Of first importance are diamonds of which £1,520,704 worth was exported entirely to Germany in 1912. Besides diamonds considerable quantities of copper ore are mined as well as tin ore, lead and marble. The territory therefore is a very valuable one.

The next most important resource of the colony is its pasture land. Stock raising is in some respects a well developed industry as is shown by the export figures. Most of the live animals that are sold are sent to the Union of South Africa, and it may be noted that the stock raisers of German South West Africa have obtained most of their breeding animals from the neighbouring British Dominion. The inter-relation between the trade of German South West Africa and the Union of South Africa is most marked, particularly as regards the agriculture of the two countries. Moreover there is quite a considerable settlement of British subjects, chiefly Boers, in the south of the German possession.

The article in question gives a good deal of information on animal production and the diseases of stock. In regard to the latter, German South West Africa appears to have represented in it most of the more serious maladies.

As regards plant production there is not very much to be said. Tobacco and cotton are grown experimentally but the country as a whole does not seem to be well adapted at all for the ordinary tropical crops. In fact German South West Africa, particularly the higher levels of the country, are quite sub-tropical and in many districts night frosts are experienced and curious mists which sometimes render the vegetation so wet that water drops to the ground as if it had been raining.

For the compilation of the agricultural portion of the article under review the Imperial Institute is indebted to Mr. A. H. Kirby, B.A., Assistant Director of Agriculture, Southern Provinces, Nigeria, and formerly on the staff of the Imperial Department of Agriculture for the West Indies.

A book called The World's Cotton Crops, by John A. Todd, B.L., published by A. and C. Black, London, at 10*s.* net, is favourably reviewed in the *Botanical Journal* (London, July 1915). The book appears to deal with the subject in a very comprehensive manner, and the author, if one may infer from the illustrations reproduced, is familiar with West Africa. One useful feature of the book is the ten excellent maps that accompany the letterpress. The bulk of the work devoted to authoritative accounts of actual cotton growing is also favourably commented upon.

THE POISONOUS NATURE OF CASTOR OIL SEEDS.

The following is a summary from the *Journal of the Board of Agriculture* (England) of a paper on poisoning by the seeds of the castor oil plant read by Kobert at the meeting of the Union of German Experiment Stations at the end of 1913.

'There is only one species of Ricinus plant known to botany, viz., *Ricinus communis*, L., but there are a number of varieties. All the varieties tested have proved poisonous, no matter what the size or colour of the seeds. The poison is contained in the shelled seeds and not in the shell, capsule, or oil extracted from the kernel. The substance containing the poison is known as Ricin; it is not visible as such in the oil-free kernel; in quantity it forms only 1 per cent. of the dry, oil-extracted kernels. As, however, Ricin exceeds strychnine or arsenic in intensity, small quantities only of Ricinus seeds suffice to make a feeding stuff poisonous, a single gramme of the kernel mixed with several litres of milk having proved sufficient to poison a calf.

'Castor oil seeds are introduced into feeding stuffs in various ways. In the first place the hedges of fields of ground nut and sesame in the tropics are often of Ricinus plants and the seeds may thus get mixed with those of ground nut or sesame at harvest. During transport, in storage, and in unloading there are again possibilities of castor oil seeds being mixed with other seeds. A further risk is run at the pressing factory where the machines may be badly cleaned after pressing the castor oil seeds, so that these become mixed with the next kind of seeds pressed. Again, for a soap-making process in Germany the use of castor oil seeds is necessary, and there is the chance of their getting into animal foods owing to the amount of transport of these seeds that has to be carried on. Lastly, large quantities of the shells are sold at low prices to manufacturers of compound feeding-cakes who grind and use these shells in the cakes. As no method is known of completely freeing the shell from the kernel, it follows that these cakes must, as a rule, be poisonous, and on an average Kobert estimates that at least 1 per cent. of kernel matter will be present with the shell, an amount which is more than sufficient to cause fatal poisoning of cows when it is remembered that cakes are fed at the rate of from $2\frac{1}{4}$lb. up to $8\frac{3}{4}$lb. per head per day. Farmers should refuse all such cakes, and merchants who resort to such practice are as guilty as if they included arsenic in their cakes.

'The poison, Ricin, is an albumin and has the characteristic (1) of an albumin, (2) of a ferment of enzyme, (3) of a toxin, (4) of an agglutinin.

'From the albumin nature of the poison it results that the mixture of Ricin with human or animal foods cannot be detected by purely chemical methods, even when one hundred times the fatal dose is contained in the foods; but the possibility of extracting the poison from foods by water or other method rest on the albumin nature of the poison.

'The enzyme characteristics of the poison are useless for purposes of detection, since feeding cakes are always found to contain enzymes similar in effect to Ricin.

'As regards its toxic effects immunity is reached by small and gradually increasing doses; and in the blood serum of immunized animals 'antiricin', which has the effect of an antitoxin, is formed. This serum has been found extremely effective in the detection of extremely small quantities of ricin, but there is the drawback with this method that a different serum is produced in the case of some varieties.

'The method of detection by injection into guinea pigs and observing whether symptoms of super-sensitiveness are produced is not recommended by Kobert.

'He lays stress however, on the efficacy of a third method which rests on the agglutinin characteristics of the poison, i.e., even if diluted to one-millionth part of the original strength it coagulates the blood corpuscles of guinea pigs, and a substance like sealing wax is obtained on filtering. This method holds good for all varieties of Ricinus and is even more sensitive than the serum test. Even here it must be remembered that 'phasins' give a similar reaction. Ricin, however, will stand a temperature of 70° to 75° C., while the only phasins that can be subjected to this temperature without being denatured are those present in *Phaseolus communis* and related indigenous legumes, and to detect these from ricin toxicological methods must be employed, e.g. subcutaneous injections with rabbits.

'The paper concludes with elaborate directions as to the conduct of tests for the detection of ricin in feeding stuffs.'

CARBON DIOXIDE GAS IN INCUBATION.

The purpose of the investigation dealt with in the following abstract taken from the *Experiment Station Record* was to determine the presence of carbon dioxide in natural incubation, and the relative requirements as to ventilation and carbon dioxide during artificial incubation:—

A specially constructed incubation apparatus that would hatch eggs and at the same time allow for an accurate control of all factors was used. This experimental incubator consisted of four essential parts: the incubator, humidifier, gas meter, and air pump. Two commercial incubators were also used to determine the carbon dioxide in these types, and nests for sitting hens were prepared in such a way as to enable the drawing of samples of air from under the hen. The work extended over five years, nearly 10,000 eggs being used.

The results of these studies indicated that the chief source of carbon dioxide in incubation is the embryo, with the egg shell, hen, nest material, and room air as minor sources. After the third day the increase of carbon dioxide is proportionate to the increase in weight of the developing embryo.

The amount of carbon dioxide under sitting hens at the beginning of the period of incubation is much higher than for the room and increases to 50 or 60 parts in 10,000, while in the commercial incubators tested it increased to from 30 to 50 parts in 10,000. From this it appears that carbon dioxide is not a limiting factor in commercial incubation. However, ventilation is necessary in incubation in order to remove a portion of the respired carbon dioxide and prevent asphyxiation of the embryo. It was found that the normal embryo is able to withstand a wide variation of carbon dioxide during incubation. Little effect was noted on the percentage hatch where the carbon dioxide occurred in from 30 to 60 parts per 10,000, but as the amount rises above 150 parts there is a marked decrease in the number of chickens hatched.

It is concluded that in all incubators carbon dioxide will be found, and that while its presence is not essential to successful incubation, its occurrence up to 60 parts in 10,000 is not prejudicial to incubation. Factors influencing the amount of carbon dioxide in the egg chamber of an incubator are rate of ventilation, number of embryos, period of incubation, size of egg chamber, temperature, and carbon dioxide in the air of the incubator room.

BRITISH GUIANA: REPORT ON THE ONDERNEEMING INDUSTRIAL SCHOOL, FOR 1914-15.

The agricultural work conducted on the farm attached to this school has yielded during the year interesting and useful results. Apart from this aspect the farm has again proved itself to be a financial success. The total expenditure on the whole farm for the year under review was $1,491·60, while the revenue from farm produce sold, amounted to $3,801·36. The net profit on the year's working was $2,506·42 as compared with $1,166·10 in the previous year and $925·10 in 1912-13.

During the year increases in the area under coco-nuts and limes have taken place, and experimental plots of Guinea corn and castor oil have been established. A few hundred Arica nut palms and some Abais palms (*Elaeis guineensis*) have also been planted out. The coffee cultivation which had suffered from the 1911-12 drought appears to have recovered its productivity, the yield for the year under report having been 20 per cent. higher than in any previous year. A portion of the yield, however, rightly belongs to the previous year when the crop was very late. The cacao fields are reported to be in good order and free from disease of any description. Like coffee, the yield of cured cacao was much higher than in the previous year.

The Para rubber trees have continued to make fair growth. The tapping experiments have been continued, and during the year reviewed, the yield per tree was slightly over 4 lb. Two hundred younger trees on the farm have now been selected and are about to be experimentally tapped.

One of the most interesting sections in the report under notice is that devoted to the subject of lime cultivation. At the annual session of the Combined Court of British Guiana in March last, a vote of $3,100 was obtained for the erection of a small factory at Onderneeming for concentrated lime juice on similar lines to those obtaining at the Government Factory in St. Lucia, which has proved a great success. The idea of obtaining a factory is said to be of some years standing, and satisfaction is expressed at a prospect of its early erection. The guarantee that there is to be a factory has also caused increased activity in lime cultivation. At Onderneeming every care is being taken of the lime cultivation, and the area is being gradually extended. During the last quarter of the year 349 barrels of limes were sold, bringing a revenue of $212, while seedlings and stumps sold from the Onderneeming nursery totalled 2,575 valued at $23·94.

The coco-nut cultivation is being gradually extended, 3 acres of new land having been planted during the year bringing the area under coco-nut cultivation up to 27 acres. The trees have made satisfactory progress and have been free from disease. The palms grown from nuts imported from the Straits Settlements, Ceylon, and some of the West Indian islands, are now coming into bearing and records of yields, varieties, etc. are being kept.

Miscellaneous plants on which notes appear in this report include the Souari nut tree (*Caryocar nuciferum*), the Brazil nut tree (*Bertholletia excelsa*), and Tonka bean (*Dipteryx odorata*). All these have grown satisfactorily. The Tonka bean and the Souari nut tree possess considerable economic possibilities.

In connexion with nursery work, the number of plants sold during the year was 3,839. These were chiefly lime and coffee seedlings.

Finally, the Onderneeming School has achieved financial success in regard to its animal stock farm. The cattle have thriven well during the year under report, while from a monetary point of view the farm has done better than in any previous year. The account shows expenditure for the year as $1,004·94, and a revenue of $1,405·55. A net profit on the stock farm was $640·50 as against $202·24 in the previous year. It may be added that pigs continue to prove remunerative. A boar and six sows comprised the herd, and sucking pigs and pork bred from them realized during the year $103·69.

UTILIZATION OF TROPICAL FEEDING STUFFS IN THE UNITED KINGDOM.

In continuation of efforts to encourage the feeding of by-products of certain tropical crops to live-stock in Great Britain, the Board of Agriculture publishes further notes on coco-nut, palm-nut cakes and ground nut cakes, in the Journal of the Board for July 1915.

It is stated that an average sample of coco-nut cake may contain 22 per cent. of albuminoids and 10 per cent. of oil; it is thus not so rich in flesh-forming substances as linseed cake, but in other respects is not dissimilar to that feeding stuff. On the continent coco-nut cake is favoured as a food for dairy stock. It is damped before use and fed in quantities of from 3 lb. to 4 lb. per day; it is said to be eaten readily; sufficient data as to its suitability for stock feeding in Great Britain have not yet been accumulated. Theoretically it should be about equal to linseed cake, and, at present prices, farmers would be well advised to use it as a substitute for more expensive foods in the concentrated rations for dairy cows, and they should certainly give it a trial in feeding for meat production.

Coco-nut growers will regard the foregoing with interest and satisfaction, for the utilization of the nut on an extensive scale for feeding purposes is likely to cause the maintenance of prices at a high level.

Palm-nut kernel cake which is dealt with next in the journal does not interest the West Indies directly. It is worth noting, however, that the experience of foreign stock feeders should appear to indicate that palm-nut kernel cakes would make a very good substitute for linseed cake in feeding dairy cattle. Cows may receive up to 5 lb. per head per day.

The subject of ground nut cake as a food stuff is dealt with in a special article at considerable length. It may be noted that both dairy cows and fattening cattle may be fed with this feeding stuff in small quantities. Pigs may be given up to 2lb. per head per day, and a firm bacon of good quality is said to result from the feeding. But care must be taken to begin with very small quantities. For horses, ground nut cake seems to have been found especially suitable and numerous experiments have been made in which this food has satisfactorily replaced part of the oats ration for horses. In concluding it is well to add a note of warning in regard to the possible danger from feeding ground nut cake. It appears that, while the high protein content is largely responsible for the high feeding value of the cake it is also a source of danger, favouring the production of harmful decomposition products, though this can, as a rule, only occur when nuts in bad condition are used for making the cake. The nature of this poisoning has been carefully worked out by different German investigators.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 7, 1915, with reference to the sales of West Indian Sea Island cotton:—

Since our last report Sea Island cotton has been absolutely neglected.

The Annual Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, dated August 2, is as follows:—

The market opened about November 15, basis Fine 18c., Fully Fine 21c., Extra Fine 23c., and ruled at these prices until February 1, when Fine advanced to 20c. to 21c., and Fully Fine to 22c., Extra Fine still selling at 23c. These prices held until May 1 when Fully Fine advanced to 24c. to 25c., and Extra Fine to 25c. to 26c.

This report shows that the total exports of Sea Island Cotton from the United States to Liverpool and Manchester, up to August 2, 1915, were 105 and 1,819 bales, respectively.

The following information about the Growing Crop is also taken from the Annual Statement of Henry W. Frost & Co., dated August 2, 1915:—

The acreage is larger than the last. In Florida the increase is small, in Georgia 15 per cent. to 20 per cent., in Carolina 10 to 15 per cent. It is, however, well, not to forget that there is a considerable decrease in the amount of fertilizers used, which will off-set in a measure the increase in acreage. Crop reports at this writing are generally promising, and the estimate of a crop of 100,000 bales for the three States is considered conservative. It is thought the trade will need it all at moderate prices.

Meeting of the Agricultural and Commercial Society of Grenada.—Mr. J. C. Moore, Superintendent of Agriculture, writes that a well attended meeting of the Grenada Agricultural and Commercial Society was held at the Botanic Gardens on July 8.

On the invitation of the President (Hon. D. S. DeFreitas) on behalf of the Society, His Excellency the Governor (Sir George Bazil Haddon-Smith, K.C.M.G.) kindly presided.

After addressing the meeting His Excellency presented to Mr. Joseph Marecheau a silver cup awarded him by the Society as the competitor who obtained the highest merit in the Cacao Prize Holdings Competition in 1914.

A paper on the cultivation of limes was read by Mr. J. C. Moore, the Superintendent of Agriculture. The introduction of this subject was both appropriate and opportune as considerable attention is now being given to lime growing in Grenada and Carriacou. All points, from the raising of seedlings to the fruiting of the trees were dealt with; special attention being given to the selection of land, wind protection, planting distances, drainage, and the control of insect pests. An interesting and useful discussion followed, and His Excellency decided to have the paper printed for local distribution.

Mr. W. M. Malins-Smith, the Agricultural Instructor, then read a paper on the diseases of cacao, in which he described, and laid stress upon the importance of adopting those remedial and preventive measures now recognized as essential to successful orchard sanitation. This paper was also followed by a discussion.

His Excellency in his closing remarks expressed his desire to give every encouragement possible to the advancement of agriculture in the colony.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. In a recent communication from Mr. J. C. Moore (Superintendent of Agriculture) it is stated that the work in the Experiment Station has consisted in the preparation of land for provision crops and in the distribution of plants, in connexion with which 400 limes and 500 coco-nuts have been sent out. Observations relating to staple crops and stock furnish the information that the progress of the cacao crop is satisfactory and that spice and sugar crops are normal. Lime planting has just begun. It is stated that experimental plots of limes have been started in St. George's and at the St. Cyr mountain settlement.

In regard to agricultural education it is reported that a number of text-books and Imperial Department pamphlets have been procured for the use of the local Agricultural Cadets.

The average rainfall at twenty-five stations during June was 6 inches, ranging from 1·54 to 9·59 inches.

In a later communication to this Office the Superintendent of Agriculture mentions the preparation of land at the St. Cyr mountain settlement for a one-acre demonstration plot of limes. From the Botanic Gardens the following plants were distributed during the month of July: cacao 500, coco-nuts 2,469, limes 7,750, cuttings 572, seeds 145 lb., and 27 others. In regard to staple crops, cacao is said to be very promising, while limes and spices are regarded as satisfactory; sugar normal. The planting of limes continues and the Superintendent had visited several estates in connexion therewith. Very good agricultural weather is said to have prevailed, the average rainfall for the month being about 12 inches.

ST. VINCENT. In this island, according to a report from Mr. W. N. Sands, Agricultural Superintendent, much progress has been made with work in the Experiment Stations. Among the plants distributed were 800 sweet potato cuttings and 400 sorghum, while from the nurseries 700 lime and 140 mahogany plants were sent out. The condition of the crops, on the whole, was satisfactory, but insect attacks, particularly of arrowroot, ground nuts and corn, were noted. The bronze beetle of cotton has been prevalent in certain parts of the Windward district. A root disease of corn appears to be widely distributed and may prove difficult to control. The mosaic disease of tobacco was observed at Belair estate. The Agricultural Department has been able to assist materially with advice and with practical measures for dealing with the various pests. There was a meeting of the Agricultural and Commercial Society on July 7, at which His Honour the Administrator presided, when correspondence in reference to prices to be paid for the cotton crop of 1915-16, and freight rates on cotton, were discussed. The rainfall recorded at the Botanic Station was 16·36 inches; at the Experiment Station, 10·52 inches.

ST. LUCIA. According to Mr. A. J. Brooks, a good deal of activity characterized the Experiment Stations during July. Amongst the operations carried on there are to be noted preparing land for ground-nuts, transplanting onions,

distributing lime plants, sowing lime seeds, and planting out orange stocks for budding in 1916. At the Botanic Gardens in Castries, the whole of the labour during the month has been devoted to hastening the conversion of the existing main walk into a driving road. The radiating beds in the centre have been removed and a bed of palms 50 feet wide is being planted up. This should greatly improve the gardens as a whole.

Reporting on the condition of the staple crops it is said that the cacao crop is likely to be late, while as regards sugar-cane good growth is being made. The lime crop during July was coming in heavily.

A special effort on the part of the St. Lucia Department is the preparation of leaflets dealing with local problems of practical importance. Up to the present leaflets on the following subjects have been sent out: The Cultivation of Peanuts, Notes on the Planting out and After Treatment of Budded Oranges and Grape Fruit, The Use of the Donkey as a Transport Animal for St. Lucia, Lime Cultivation, Special notes dealing with Common Errors in St. Lucia. Other educational work has included the examination of six teachers for the head teachers' certificate at the Botanic Gardens, in agriculture. Assistance has been given the Choiseul Boy School in laying out their new garden adjoining the Experiment Station. The rainfall at Réunion during July was 8·06 inches compared with 24·71 at Castries.

DOMINICA. The Curator (Mr. Joseph Jones) reports a continuation of work in the nurseries, and in the lime and cacao experiment stations during the month of July. There were shipped 13 bags of cacao and 3 bags of kola nuts. The local price paid for good yellow limes dropped during the month from 7*s.* to 6*s.* per barrel; there were no cable quotations for concentrated juice. Continued activity and further extensions in the planting of limes are also recorded. Experiments carried out to determine the behaviour of lime juice on freezing, formed the subject of a special report to the Commissioner of Agriculture. In regard to Agricultural Education and Reading Courses, it is mentioned that thirteen candidates presented themselves for examination, four of whom were selected for a two-years' course of training. The half-yearly examination of the Agricultural Pupils was held on July 9. The weather during July was unusually wet, rain falling on twenty-eight out of thirty-one days, making many agricultural operations difficult to carry out. The rainfall for the month was 14·84 inches. The plant distribution was as follows: limes 12,775, cacao 250, nutmegs 25, budded citrus 7, grafted mangoes 3; making a total of 13,060.

ANTIGUA. Writing on the subject of agricultural events during July, Mr. J. Jackson (Curator of the Botanic Station) refers to the institution of experiments with maize and sisal. The last mentioned will be followed with special interest.

The young cane crop on the estates is said to be continually improving throughout the island. So far it has had no serious set-back since planted. The harvesting of last year's crop was almost completed. During July there was a comparatively small area of cotton planted.

Other items of interest include the planting of forest trees around Wallings, and the delivery of a lecture by Dr. Tempany to agricultural students. During the month 5·10 inches of rain fell.

MONTSERRAT. In a communication received at this Office from the Curator (Mr. W. Robson), it is mentioned that in July the collection of cotton stainers was found necessary, and 7,000 were taken on a half-acre plot in Grove Station within a fortnight. Continued attacks of cotton worm have been experienced which rendered constant dusting necessary. Attacks of aphides were very general and severe. Experiments have again been started to further investigate the damage done to cotton bolls by stainers. A successful meeting of Onion Growers' was held on the 26th to discuss the question of an Onion Growers' Association, the Government having approved of an advance being made to finance the scheme. The rainfall for the month was as follows: Grove Station, 8·72; Harris' Station, 7·37 inches.

ST. KITTS. Mr. F. R. Shepherd, Agricultural Superintendent, says that the reaping of the old cane crop on muscovado estates still continued during July, but the difficulties were great owing to the heavy rains. On the night of July 15, an average of about 6 inches fell all over the island and this was followed next night by a general precipitation of 2 inches. This abnormal fall caused great washes in the fields and roads and did much damage. However, the young cane crop is in a very healthy condition and is growing rapidly. The prospects at the present time for a record crop are very promising.

The cotton crop is in an equally satisfactory condition and at this period is the most regular and promising crop that has been seen in St. Kitts. If the bolling is on a par with the growth of the plants there will be an excellent return of lint.

NEVIS. Mr. W. I. Howell, the Agricultural Instructor at Nevis reports the following plant distribution during the month of July: sweet potato cuttings 2,800, Lima beans 10 lb. selected cotton seed 417 lb. The young canes throughout the island were quite healthy and vigorous, and making rapid progress in growth, the condition of the crop on the whole being satisfactory. Young cotton is said also to be very promising; the more advanced fields are blossoming freely and the later ones have made a good stand. Preparation and planting are still in progress. Cotton worms have done a little damage to some fields. The rainfall for the month was 8·14 inches; for the year to date, 25·91 inches.

VIRGIN ISLANDS. Mr. C. A. Gomes, acting Curator, reports from Tortola that very hot days with high winds were experienced during the month and the weather conditions were adverse to agricultural operations. It was accordingly a very unfavourable month for planting cotton and many growers were still awaiting seasonable weather. At the same time the condition of the cotton fields planted is said to be surprisingly good in view of the unfavourable weather, but immediate rains are necessary to maintain the vigour of the plants. During the month of July the establishment of the cotton seed farm was successfully carried through. The acting Curator visited the island of Jost van Dykes and inspected the cotton-growing areas there. The area under this crop is less than in previous years, food crops having been planted in some of the fields which in previous years were established in cotton.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture arrived in Barbados from an official visit to Grenada by the C.R.M.S 'Chignecto' on August 24.

Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, left Barbados on August 23 by the S.S. 'Denis' for New York on three months leave of absence.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the subject of storm-damaged crops and means of reparation.

On page 276 will be found a summary of an interesting paper on poisoning by the seeds of the castor oil plant read at a meeting of the Union of German Experiment Stations towards the end of 1913.

Notes on the utilization of tropical feeding stuffs in the United Kingdom are given on page 277.

Insect Notes, on page 282, deal with the control of the changa or mole cricket and other insect pests in Porto Rico.

Entomogenous fungi of Porto Rico, and the use of fungus parasites in scale insect control comprise Fungus Notes, which will be found on page 286.

Poisonous Beans.

A question of the poisonous nature of certain forms of Lima bean, dealt with recently in an article in the *West Indian Bulletin*, has been responsible for a note on the subject in *The Field* (London, July 17, 1915). In this it is stated that there is no great difference between the plants of scarlet runner or French beans and the Lima beans. The former are varieties of *Phaseolus vulgaris*, while the Lima beans are cultivated varieties of *P. lunatus*. They differ in the colour of the flowers and *P. lunatus* contains fewer seeds than *P. vulgaris*. The seeds of the cultivated races of both species vary much in colour. Those of the scarlet runner and French beans are supposed to be poisonous when mature, but as they are never eaten, except when they are quite young and inoccuous, this does not matter. Lima beans, however, as pointed out in the *West Indian Bulletin*, are eaten when mature, and there are cases of fatal poisoning resulting from eating the dark-coloured seeds. The subject of the poisonous nature of the Lima bean still continues to present problems requiring further investigation as is shown more and more by references to the subject which appear in the *Bulletin of the Imperial Institute.*

Trinidad and Tobago Wild Birds and Wild Animals Protection Ordinance.

There has recently been added to the laws of Trinidad and Tobago, Ordinance No. 14—1915, which is an Ordinance to make provision for the protection of certain wild birds and wild animals in that Colony. In this Ordinance 'Wild bird' is defined to include any bird specified in the first or second Schedule annexed to the Ordinance, or in any proclamation of the Governor under section 12 of the Ordinance, whilst 'Wild animal' includes any animal specified in the third or fourth Schedule, or in any proclamation issued by the Governor as aforesaid. This Ordinance contains the general provisions that are to be found in similar enactments that have been passed in other colonies for the protection of wild birds, the imposition of penalties for offences committed thereunder, and the customary exemptions in the case of wild birds and animals killed or taken for scientific purposes.

An important feature of the Ordinance in addition to the protection which it will afford to the wild birds and animals of the Colony, and in preventing the possible extinction of rare and valuable species, is the usefulness of the Schedules as an authorised and authenic list of Trinidad birds. Here the birds are classified and grouped together under their generic names, the scientific and popular local name of each being also given. Thus there are thrushes; wrens; warblers; honey creepers; vireos; swallows; tanagers; Orioles, cassiques, black birds, etc.; flycatchers, manakins; cotingas; woodcreepers, oven birds, etc.; ant-birds; humming birds; swifts; goatsuckers; woodpeckers; king of the woods; kingfishers and jackamars; trogons; cuckoos and tick birds; toucan; parrots; owls; corbeaux;

doves; herons, egrets and ibis; and hawks and kites. These schedules, as we have remarked will serve a very useful purpose in placing on record a complete list of the birds of Trinidad.

Progress in the Cane Sugar Industry.

Discussing the progress in the cane sugar industry of the world as evidenced by the marvellous progress of the sugar industry of Cuba through the adoption of the most modern sugar factories, the *Louisiana Planter* (July 3, 1915) avails of the opportunity to refer to the antiquated system of sugar manufacture which obtained in Barbados more than two hundred years ago, and which is still maintained there at the present time, namely, the utilization of windmill power as the motive power in grinding sugar-cane, and the open kettle system in the boiling house; and endeavours to explain why here in the West Indies, not very far apart, there should stand to-day two methods of manufacture, one involving the highest scientific research and attainment in every directoin, and the other following the old routine of centuries ago.

It is pointed out that the conditions incident to the growth and manufacture of sugar-cane in the island of Barbados are such that while the industry carried on elsewhere in a similar manner generally failed and passed away, in Barbados they have withstood all the innovations of modern progress because of their favourable climate, and of their large, intelligent, and available negro population. With reasonably fertile soils and a favourable climate, the Barbadians have been able to survive up to the present time, although continuing in their old methods of sugar production. Elsewhere those who have held on to the old methods have been driven from the field by actual necessity. That necessity is said to be gradually reaching Barbados, and it is shown that sugar houses that have developed advanced ideas, concentrating the work of several sugar houses and one ownership in the best available sugar house and there utilizing modern machinery and turning out yellow crystals instead of the old-fashioned soft open kettle sugars, have done better than their neighbours who are following in the tracks of their fathers.

Concluding, it is mentioned that there has been a move for the betterment of sugar house work in Barbados, and there is every reason to believe that after 200 years of successful sugar manufacture Barbados will come to the front with its modern sugar factories, and perhaps within the next decade one or two large establishments may make the entire sugar crop of Barbados with less human labour and at a far less cost than now, the diminished cost in human labour and in transportation being brought about by the introduction of mechanical devices of the labour-saving order.

The History and Functions of Botanic Gardens.

At the Twenty-fifth Anniversary Celebration of the Missouri Botanical Garden (October 15, 1914) Mr. A. W. Hill, M.A., F.L.S., read a very interesting paper having the above title.

At the beginning of the paper it is pointed out that travel in search for spices and drugs was the real origin and foundation of botanic gardens, though of course in recent times their functions have become greatly extended.

After crediting the Chinese with the distinction of being the real founders of the idea of botanic gardens, the author goes on to give an historical account of the Greek, Roman and later Italian horticultural establishments, and then of the earlier gardens in England. Very interesting information is given concerning the far-famed Chelsea Physic Garden and the development of the Royal Gardens, Kew, of which the author is Assistant Director.

Turning to the Colonies, Mr. Hill points out that the earliest tropical botanic gardens appears to have been founded in the West Indies, at St. Vincent, in 1764. The Indian and Ceylon gardens are dealt with at some length as well as the less tropical establishments in South Africa and Australia. In America the author pays tribute to the Botanic Garden of Harvard University with its wonderful Arboretum. 'With the Arnold Arboretum situated close at hand, Harvard has become a Mecca for botanists all the world over.'

In considering the functions of Botanic Gardens, it is shown that there has been a gradual change from the purely medicinal garden to one designed to provide a synoptical illustration of the whole vegetable kingdom. In recent times the well-known Botanic Gardens have developed into centres for the study of botany, particularly systematic botany. Kew occupies a unique position in this respect, its establishment having specialists in many different branches whose systematic and economic work has done a vast amount to develop the botanical resources of the British Empire.

St. Lucia Leaflets.

Mention is made on another page, of the fact that the St. Lucia Agricultural Department under Mr. A. J. Brooks has been issuing leaflets on agricultural matters of local importance. Copies of the first two of these have been received. No. 1 is entitled The Donkey as a Transport Animal for St. Lucia, and in the opening paragraph it is stated that not sufficient use is made of this animal in a mountainous island like St. Lucia, especially for the transport of agricultural produce to and from the coastal villages. The economical nature of the donkey is briefly described, and it is stated that in most of the other West Indian islands this animal finds increasing use as a beast of draft and burden. The capacity of the donkey is dealt with, and it is finally pointed out that the initial cost of these animals is much below that of any other beast of burden and it soon repays the capital outlay.

The second leaflet is longer and deals with the cultivation and uses of the ground nut. The subject of cultivation is treated in a practical manner and should serve a useful purpose in stimulating the cultivation of ground nuts amongst the small holders of St. Lucia.

INSECT NOTES.

NOTES ON PORTO RICO INSECTS.

CONTROL OF THE CHANGA OR MOLE CRICKET.

The Changa or mole cricket (*Scapteriscus didactylus*) has been a serious pest in Porto Rico for several years, and this, or other related forms, has been troublesome in other West Indian localities. The Porto Rico Board of Commissioners of Agriculture has recently issued *Circular No. 6*, entitled Control of the Changa, by Messrs. S. S. Grossman and G. N. Wolcott.

The method of control which has been found satisfactory consists in the use of a poisonous bait prepared by mixing 100 lb. of low grade flour and 2½ to 3 lb. of Paris green. This is applied in a ring about the plant to be protected or sown broadcast over the surface of the ground.

The experiments which have led to the adoption of this poison bait were conducted principally in connexion with the tobacco crop and they have extended over several years The same treatment has been found applicable to sugar-cane and vegetable crops.

The ring method is particularly applicable to tobacco and sugar-cane. About a heaping teaspoonful of the mixture is used per plant and it is applied in a shallow trench about 1 inch deep and about 3 inches from the plant, that is to say, the ring will be about 6 inches in diameter with the plant in the centre. The poison mixture should not be allowed to come nearer than 3 inches to the plant nor should any of it be dropped on the plant, as it has a burning effect on the roots and leaves of plants.

In using this bait in the broadcast method, it is necessary to free the soil of plant growth as far as possible by ploughing, forking or hoeing in order to deprive the mole crickets of food. In about a week the application is made, amounting to about 300 lb. of the mixture. After another four or five days, during which the changas have had an opportunity to eat the poison mixture, planting may take place in the ordinary way.

In an experiment with this method of application in a vegetable garden very satisfactory results were obtained.

The experiment consisted of twenty lots of 300 plants each; ten lots (3,000 plants) were planted on the land which had received applications of the Paris green and flour mixture and an equal number was planted on land which had not been poisoned.

In the latter case 3,000 plants were planted on land which had not received an application of poison, 1,405 grew and 1,595 were lost, while in that portion where the poison was applied only fifty-six plants were lost and 2,944 plants grew.

On the treated land less than 2 per cent. were lost while on the other, the loss was 53 per cent.

The cost of this treatment is rather high, amounting to some $8 or $10 per acre, including labour, when the flour costs $45 per ton (2,000 lb.) and Paris green is obtainable for from 12 to 16c. per lb. In the opinion of the writers of the Circular the expense of this treatment is fully justified since the mole crickets are all killed out and an almost perfect stand of plants is obtained, as against an imperfect stand in spite of repeated replanting and supplying and eventually a short crop resulting from an irregular and patchy stand, in land where the changas abound and where no treatment is given or where measures other than that mentioned above are tried.

INSECTS AFFECTING VEGETABLE CROPS IN PORTO RICO.

Bulletin No. 192 of the United States Department of Agriculture, by Thos. H. Jones, gives a brief account of the principal insect pests affecting vegetable crops in Porto Rico. Many of the insects mentioned are known in the Windward and Leeward Islands.

In the case of the insects which occur also in the other islands, those in Porto Rico are only of general interest, but in the case of a severe pest which does not occur in these islands and which is liable to be or which might be introduced from Porto Rico a very considerable amount of importance should be attached to it.

It will be remembered that in a recent number of the *Agricultural News* (see issue for April 24, 1915) an account was given of the sweet potato weevil (*Cylas formicarius*). This insect was there recorded as occurring in India and the Far East, in Africa, the United States, Jamaica, Cuba, British Guiana, and the Bahamas. It is now recorded from Porto Rico, and as this insect does not occur at present in the Leeward and Windward Islands and Barbados, great care should be exercised to prevent its introduction. *Cylas formicarius* is fully as serious a pest as the Scarabee (*Cryptorhynchus batatae*), and if it became established in any of these islands it would very considerably reduce the crops of potatoes.

The Southern beet webworm (*Pachyzanchla bipunctalis*), the larva of a small moth, has been found attacking garden beans and the sword bean (*Canavalia ensiformis*) in addition to weeds of the genus Amaranthus. On the garden bean and the Amaranthus, the leaves were eaten and these were webbed together forming shelter for the larvae, but in the case of the sword bean the larvae were found inside the green pods.

This is of interest in connexion with the appearance of pests of beans in other West Indian islands.

The Mole cricket (*Scapteriscus didactylus*) is regarded as the most serious pest of vegetable crops. Of these the tomato, egg plant, turnip and cabbage are stated to be most affected, whilst the water-melon, bean, sweet potato, and yautia are seldom or never attacked.. The method of control for this insect given above will probably enable the attacks of this pest to be better controlled in the future than in the past.

H. A. B.

Fumigation of Baled Cotton.—In connexion with the article on the Pink Boll worm which appeared in the last number of the *Agricultural News*, the following reference to that insect and the attempt of the Federal Horticultural Board to fumigate baled cotton should be of interest: 'W. D. Hunter and G. B. Sudworth, of the Federal Horticultural Board, had a conference at Pittsburgh, Pa., on April 14, with the designers of a machine which may be adapted for the fumigation of bales of cotton. On April 20 a conference was held with the Department regarding the proposed action of the Federal Horticultural Board, regarding the fumigation of all foreign cotton received in this country to destroy the immature stages of *Gelechia gossypiella*. Representatives of cotton mills from all parts of the country were present.' (*Journal of Economic Entomology*, Vol. 8, No. 3, June 1915.)

VULCANIZATION EXPERIMENTS ON PARA RUBBER.

The cause of variability in Para rubber has for many years been the subject of much discussion and some investigation. In the Federated Malay States, during recent years, the work done has been considerable, but it seems that it is only now that real light is being thrown upon the subject. The following is a summary of recent results obtained by Eaton and Grantham:—

(1) Considerable variation occurs in plantation Para rubbers even in the case of 'first latex' rubbers, both from rubbers from the same estates and from different estates.

(2) This variation is connected principally with the behaviour of the rubber on vulcanization, i.e. its rate of cure, and not in respect to its strength, elasticity and general properties, especially in the case of properly prepared 'first latex' samples.

(3) If the rate of cure be known or ascertained under specific conditions, vulcanized rubber having similar mechanical properties can be made from all good samples of 'first latex' rubbers.

(4) A difference in mechanical properties does exist, even among so-called first quality rubbers, but these differences are greater between high and low grade plantation rubbers; some rubbers never attain the maximum mechanical properties reached by others, whatever period of cure is adopted. These differences in the case of 'first latex' rubbers however, are not so important to the manufacturer as the differences in the rate of cure, and are not of the same order.

(5) The rate of cure is due to the presence of some noncaoutchouc substance in the latex, possibly the proteins or some other constituent, or to some degradation product derived from these substances which acts as a catalyst and accelerates the rate of cure.

(6) This substance may be already present in the latex, and its amount in the raw rubber determined by the mode of preparation and coagulation, or it may be subsequently formed in the latex by decomposition, and taken up by the rubber in variable quantity according to mode of preparation, or alternatively it may be formed in the coagulum in variable quantity depending on the amount of serum (or moisture) left in the coagulum or the presence of preservatives which hinder or prevent its formation. The alternative theories await investigation.

(7) Smoking, removal of excess of serum (or moisture) in the washing and machining processes and preservative are among the artificial factors which either hinder the formation of this substance or, if it already exists in the prepared rubber, partially destroy it. The natural differences in latex due to natural causes may also have a similar effect.

(8) The catalytic substance is probably not affected greatly by heat, since in the process of mixing and vulcanization, the rubber is subjected to considerable temperatures, although heat may prevent its formation in the latex or freshly coagulated rubber.

(9) The rate of cure of a rubber under specified conditions, is not indicated in any way by the apparent mechanical or any other apparent properties of the raw material, hence the absurdity of the present 'methods' of valuation of rubber.

(10) *Caeteris paribus*, a manufacturer probably prefers a rapidly curing rubber, as it represents economy in heat, labour and time costs, and secondly, a rubber which cures rapidly is said to have better keeping qualities after vulcanization. Rapidly curing samples should therefore obtain a premium in the market and probably would do so, if valuation were carried out on a scientific basis, provided uniformity in rate of cure is maintained at the same time.

(11) Uniformity between 'first latex' rubbers from different estates will probably be very difficult of attainment with present methods, owing to the number of factors involved, but should not be difficult of solution among such rubbers from the same estate.

(12) Two alternatives are suggested: (1) the issue of certificates giving correct rate of cure and mechanical properties at this cure; (2) the attainment of more uniformity by the method suggested in this paper and elsewhere, in which rubber from latex collected during a series of days forms part of one ball or block, which may be described as the method of averages.

THE INHERITANCE OF SIZE IN TOMATOES.

The *Ohio Naturalist* for April 1915 contains an interesting paper on the above subject, a summary of which is reproduced below. Although the paper deals only with the currant-pear tomato cross the results may have a much wider application.

A more accurate representation of the size of tomato fruits can be obtained from their weights than from their linear dimensions.

The size of fruit of the F 1 generation of the currant-pear cross is the geometrical mean between the parental sizes.

From an examination of all available data upon the inheritance of fruit-size in the F 1 generation, it appears that, when two varieties are crossed which differ widely in fruit-size (the size of fruit of one parent being probably about two, three or more times the size of the fruit of the other parent), the F 1 fruit-size will be nearer to the geometrical than the arithmetical mean; but when two parents similar in fruit-size are crossed, the size of fruits of the offspring will approach more nearly to the arithmetical than to the geometrical mean.

The average fruit-size of the F 2 generation does not exceed and is even slightly less than the average fruit-size of the F 1 generation. The segregation of size factors and the incomplete dominance of the small size factors of the red currant parent may be explained by the assumption of at least four size factors. If no parental sizes can be ever obtained, there may be more than multiple factors involved.

The fruits of the F 2 and F 3 generations agree fairly well with respect to variability and average generation size. The F 4 fruits show diminished variability and size.

In connexion with the prevention of cotton reaching any of the enemy countries Professor Dunstan, Director of the Imperial Institute, writes to *The Times* to the effect that should any stringeut measures such as the declaration of cotton as contraband be taken, due consideration should be given to the interests of cotton growers within the British Empire. The principal point raised however is in connexion with the idea that the whole of next year's supply should be bought from America in advance. This would obviously affect adversely the British cotton-growing industries in Egypt and Africa.

GLEANINGS.

The Board of Trade Journal observes that the *Jamaica Gazette* for May 13 contains a notice declaring the Panama disease of bananas to be a notifiable plant disease within the meaning of the new Plant Disease Law, No. 3 of 1915.

The exports of rubber and cotton from French Indo-China during 1914 are given in the *India Rubber World* for August 1. There was an increased shipment of rubber, while in the case of cotton there was a decided decrease amounting to nearly $8\frac{1}{2}$ million pounds.

A list of trees is published in the Barbados *Official Gazette* for July 19, available for distribution on Arbor Day which was observed on August 2. Large numbers of the following were in stock: *Casuarina* sp., Fustic, Logwood, Spanish Ash, and Mahogany. Altogether there were fifty-two different species of plants available.

The rapid increase in the imports of natural indigo into the United Kingdom is shown by figures published in the London *Chamber of Commerce Journal* for July 1915. In 1913, 4,174 cwt. was received, valued at £54,739; in 1914, 5,314 cwt., valued at £181,695. By far the greater portion of the supply is derived from India. In 1914 the United States entered into the trade for the first time.

It is stated in an article in the *Agricultural Bulletin of the Federated Malay States* that the cultivation of rice has been perfected in Spain, in certain directions, to a degree unattained in any other country in the world. Rice is grown in rotation with other crops, and special field implements are used for the cultivation of the soil. The subject is dealt with fully by Dr. E. J. Butler, in the *Agricultural Journal of India*, Vol. IX, No. 10.

According to the Trinidad *Mirror* for July 23, much interest is being shown in the newly established lime cultivation at Jerningham Junction. On another lime estate the proprietor has just installed a new crushing plant, and apparently intends to manufacture lime products on the most up-to-date lines. In the next few years it is believed that the export of lime products will add another important source of wealth to Trinidad.

Sugar dust and dextrin dust, according to the *International Sugar Journal*, are the most readily inflammable of all dust derived from ordinary materials. The source of heat required for ignition is stated to be comparatively small, such, for example, as a lighted match. Sugar ignites when projected as a cloud against a surface heated to below red heat, and when the ignition has taken place, the flame travels through the dust cloud with great rapidity.

In an article on cotton growing in Jamaica, the Demerara *Daily Chronicle* for July 23, gives the following figures in regard to the cost of producing certain minor crops including cotton: Red beans £2 3*s.* 6*d.*, giving a return of £7 5*s.* 10*d.*; corn, 18*s.* 3*d.*, giving a return of £2 17*s.* 6*d.*; and cotton, £7 9*s.* 6*d.*, giving a return of £11 5*s.*, the total profit being £10 7*s.* 1*d.* Mention is made of the success which has attended the experimental cultivation of Cauto cotton.

In the *Cuban American* for June 19, 1915, there is an article which advocates the cultivation of henequen in certain districts of Cuba. It is stated that in Nuavitas, a plantation cleared and planted costs $1,000 and in the third year begins to bring in returns. It is pointed out that not all soils are suited to henequen, but quite as many as are suited in the district mentioned to citrus trees, a large number of which have already been planted in localities quite unsuitable for their successful development.

New Sources of Meat Supply Within the Empire is the heading to a note in the *Bulletin of the Imperial Institute* for April-June 1915. The question of establishing an export trade in meat from South Africa is discussed, and reference is made to the suggestion emanating from the Imperial Department of Agriculture for the West Indies, relating to the production on co-operative lines of pork and bacon. An abstract is given of the information on this subject published in the *West Indian Bulletin* and the *Agricultural News*.

Judging from an investigation conducted at the Agricultural and Horticultural Station of the University of Bristol, beet sugar is better than cane sugar for fermentation purposes connected with the manufacture of cider. The peculiar taste of cane sugar was easily detected in the cider whereas the beet sugar did not give any new flavour to the beverage, but simply acted as a neutral sweetener, which, of course, is preferable. It is stated that this conclusion needs further confirmation by fresh experiments before much importance can be attached to it.

It is proposed by the Newfoundland Government that the following articles of West Indian interest shall be removed from the free list and made dutiable at the rate of 10 per cent. *ad valorem*: molasses, produced in the West Indian islands in the process of the manufacture of sugar from the juice of the sugar-cane, and the package in which it is imported. Also oil cake and meal, cotton seed cake and meal, pease meal, bran and other preparations for cattle and chicken feed. Indian corn, trees and shrubs and seed for agricultural purposes are also included.

Notices have appeared in the St. Lucia newspapers and *Official Gazettes* to the effect that the Agricultural Superintendent of that colony who resides at Réunion Experiment Station, will visit Castries where the Botanic Gardens are situated, regularly for one or two days in the second and fourth weeks of every month for the purpose of interviewing any person who may be desirous of consulting him on agricultural matters. Due notice will be given, before each occasion, of the date upon which he will be present, by the Agricultural Officer in charge of the Botanic Gardens.

WATER-SUPPLY.

HYDRAULIC RAMS.

On some estates in the West Indies the installation of a hydraulic ram for raising water for domestic use might be economically applied. Estate houses are often erected at a considerable elevation above their water-supply, and where this occurs it necessitates some form of pumping, otherwise the water has to be carted or carried by hand. The following useful article on the hydraulic rams is reproduced from the *Rhodesia Agricultural Journal*:—

Wherever a fall of water is obtainable, either from a running stream, a dam or other source of supply, a hydraulic ram can be operated. The principles of working a hydraulic ram are simple; they depend upon the utilization of the momentum of falling water.

Looking at the sketch here reproduced, if control valve 'V' is opened, the water will fall down the drive pipe 'S' and escape at valve 'W' until it has attained sufficient momentum when valve 'W' will close. The impulse or momentum of the stream thus attained forces the water through valve 'R' into the air-chamber 'A' and up the delivery-pipe 'D' until this momentum ceases, when valve 'W' opens and valve 'R' closes and retains this water in the delivery-pipe 'D'. Again, when valve 'W' opens the water rushes down delivery-pipe 'S' until it again attains sufficient momentum, when valve 'W' closes and a further quantity of water is forced through valve 'R' up the delivery-pipe 'D' This cycle continues automatically, and in this manner a certain percentage of the drive water is raised to a greater height than that of the surface of the supply water level.

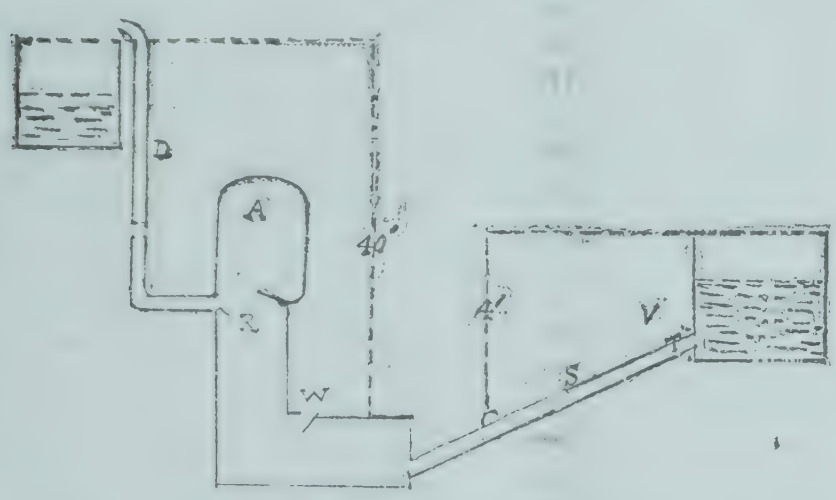


FIG. 12. Diagrammatic Section of a Hydraulic Ram.

In theory the principle may be explained thus: If 10 gallons of water fall 10 feet high in 1 minute, they would be capable of raising 1 gallon of water per minute 100 feet high, because 10 gallons × 10 feet equals 1 gallon × 100 feet in gallon feet. Again, if 100 gallons of water fall 5 feet they would be capable of raising 5 gallons 100 feet, because 100 × 5 feet equals 5 gallons × 100. But in practice these results are not obtainable, as we have to allow for the friction in the drive and delivery-pipes, the slipping and friction of the valves, and the loss of water which is necessary for the operation of the ram. Many makers claim high efficiencies, but in a number of cases these efficiencies are obtained under ideal test conditions, and it will accordingly be as well not to base our calculations on too high an efficiency. The efficiencies of hydraulic rams vary from 25 per cent. to 70 per cent. according to the make, fall, and the ratio of the fall to the lift. This does not include the friction in the drive-pipe, which will vary directly according to its length, and inversely as the square of its diameter. This means that from one-quarter to seven-tenths of the work actually done is usefully performed in the delivery of the water.

Generally speaking, a suitable ratio of fall to lift is 1:10, whilst ratios of 1:4 up to 1:20 are quite workable for most types of rams. Outside of these ratios the rams are more expensive, and for higher ratios are less efficient. Taking a ratio of 1:10 as shown on the sketch, viz., a 4-feet fall and a 40-feet lift, and with a supply of driving water of 28 gallons per minute, a ram would in theory be capable of delivering 2 $\frac{4}{5}$ gallons per minute. The probable efficiency with this ratio would be about 40 per cent., and that means the actual quantity of water delivered by the ram would be about $1\frac{1}{10}$ gallons per minute.

Before ordering a ram, it is absolutely necessary to supply the maker or his agents with the following particulars:—

(1) The vertical fall in feet or inches which is obtainable from the source of supply. This working fall should be measured as shown on the sketch from the top of supply water level to such a level that escape valve 'W' would have a free outlet.

(2) The vertical height to which the water has to be raised above the level of the ram.

(3) The length of the delivery-pipe required.

(4) The approximate quantity of drive water, measured in gallons per minute, which is available. Methods for the measurement of flowing water are described in Bulletin No. 64 of February 1911, issued by the Department of Agriculture, Salisbury.

(5) The number of gallons it is desired to raise in a day of twenty-four hours.

(6) The length of supply pipe that is necessary. (This should be kept as short as possible.)

It will be obvious that only in rare instances will all these conditions be the same in each case; for instance, there may be a large quantity of drive water, low fall, and medium lift, and in another case a small quantity of drive water, high fall and high lift, and all other various combinations. Therefore it is most important when ordering a ram to supply the makers or their agents with full particulars as mentioned above.

During the night of August 10 a heavy gale passed over Dominica which caused a good deal of damage in the Botanic Gardens. About 100 trees, some of large size, have been uprooted or damaged, and a number of species of rare trees of which there was only a single specimen have been lost. In the south of the island damage was caused by the wind from the south-east, which commenced to blow about 6 in the evening. Many of the exposed estates lost a number of trees together with a considerable portion of the lime crop. In some cases the loss is covered by insurance. In regard to the Gardens, a special grant of £30 has been obtained to assist in clearing away the refuse, the extent of which is very vividly shown by a series of photographs forwarded by Mr. Jones, the Curator. In connexion with the foregoing information, the editorial in this issue dealing with storm-damaged crops will be read with interest.

FUNGUS NOTES.

THE ENTOMOGENOUS FUNGI OF PORTO RICO.

In view of the importance attaching to fungous control of insect pests in the West Indies generally, the issue of a bulletin on the entomogenous fungi of Porto Rico is a welcome event. It is published by the Board of Commissioners of Agriculture in that island as No. 10 in their series, and has been prepared by Mr. John R. Johnston, formerly Pathologist to the Sugar Producers' Association.

The following is a brief summary of the author's annotated list. The information thus given will probably lead to the recognition of some of the less familiar species in places where their presence has hitherto gone unnoticed.

The Aphis Fungus (*Acrostalagmus albus*) forms a woolly white or slightly yellowish covering over the plant lice on sugar-cane, Cucurbitaceous plants, and on okra. Closely resembles the shield scale fungus (*Cephalosporium lecanii*).

The Brown Fungus of White Fly (*Aegerita Webberi*), well known from the attention it has received in Florida, occurs very locally in Porto Rico but is abundant where it is found. Forms a brown, usually sterile, rounded cushion enclosing the affected insect.

Of the difficult *Aschersonia* group the following three species have been recognized:—

The Red Fungus of White Fly (*A. aleyrodis*), is recorded as common on the guava white fly. Characterized by its bright red colour at maturity.

The Top-shaped Aschersonia (*A. turbinata*) is regarded by the author as probably including the various hemispherical, cylindrical and top-shaped forms.

It may be added that a fungus regarded as this species, assuming in its most developed condition the form of one or more cups or excavated cylinders situated on a circular cushion, is fairly common on scale insects in the wetter islands of the Lesser Antilles.

The Lemon-yellow Fungus of White Fly (*A. flavo-citrina*) is recorded as common on the guava white fly.

A fourth *Aschersonia*, not identified, with an ascigerous stage probably belonging to *Hypochrella*, is described from specimens on a white fly on Bignonia.

The Yellow-green Fungus of Mealy-bug, familiar on *Pseudococcus calceolariae* under the leaf-sheaths of sugar-cane in the West Indies, and known also in Louisiana and Hawaii, has been the subject of considerable enquiry on the part of Dr. Charles Thom and the author. Material and descriptions from various countries have been compared with each other and with material of *Aspergillus flavus*, Link, from sources other than mealy-bugs, with the result that Thom regards the various races examined as capable of being grouped under that name, including the form described as new by Mr. A. T. Speare in Hawaii under the name of *A. parasiticus*.

The Green Fungus of the Grass-worm (*Botrytis rileyi*) is recorded as forming a blue-green covering on caterpillars. The author thinks it possible that its usefulness could be increased by artificial distribution.

The Shield-scale Fungus (*Cephalosporium lecanii*) is common in Porto Rico on the shield scale of mango and the hemispherical scale, and is found occasionally on mealy-bugs. Comparison of Barbados material (F. W. South) with Porto Rican and Santo Domingan material shows them to belong to the same species.

Entomophthora aulicae has been found on hairy caterpillars infesting *Heliotropium indicum*.

An *Empusa*, thought to be *E. fresenii* has been obtained from mealy-bugs which were dead, blackened, covered with a thin whitish coating, and easily crumbled to pieces; *E. sphaerosperma* has occurred on caterpillars in breeding cages, and the same or a similar species has been collected in the field.

The Spider Fungus (*Gibellula arachnophila*) is given as not uncommon on the small jumping spiders of guava trees. The abdomen of the insect is covered by bright yellow or gray mycelium from which arise conical or cylindrical projections. A perithecial form found in Cuba is probably its *Cordyceps* stage. The perithecia are yellowish, erect, numerous, aggregated, cylindrical or upright-ellipsoidal, rounded at the upper end, about 1 mm. high.

The Moth Borer Fungus (*Cordyceps barberi*) occurs in Porto Rico collections so far only in its *Isaria* condition, the form usually found elsewhere in the West Indies.

An *Isaria* occurs on colonies of mealy-bugs, which turn black and show a thin white incrustation. The fructifications are rare, and perithecia have not been found.

The well-known Green Muscardine Fungus (*Metarrhizium anisopliae*) has been found under circumstances which suggest that it occurred in the island previous to its artificial introduction from Hawaii.

The Black Fungus (*Myriangium duriaei*), White-headed Fungus (*Ophionectria coccicola*), and Red-headed Fungus (*Sphaerostilbe coccophila*) are common in Porto Rico as elsewhere in the more humid of the West Indian islands on the scales of citrus trees.

The Cinnamon Fungus (*Verticillium heterocladum*) has twice been found, on an undetermined host.

THE USE OF FUNGOUS PARASITES IN SCALE INSECT CONTROL.

From the July number of the *Monthly Bulletin*, California, it appears that some embarrassment has been caused to agricultural officers by commercial claims to successful treatment of black scale with a fungous parasite, a species of *Isaria*. This has led to a formal investigation by a committee of experts who report that they find no evidence of the success of artificial inoculation.

The following summary presents the conclusions reached on this matter by Messrs H. J. Quayle and A. R. Taylor:—

'1. The effect of Isaria fungus growing under suitable conditions in a moist chamber, either in the laboratory or the field, was found to kill a fair percentage of the black scale.

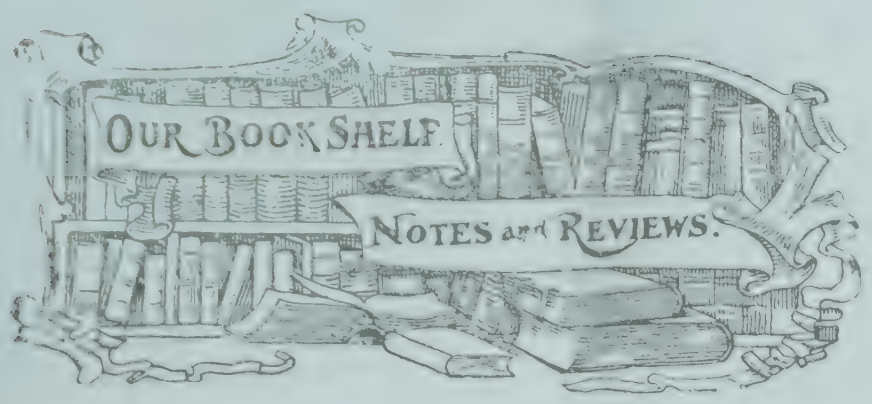
'2. The results in attempting to disseminate the fungus artificially under natural conditions in the field, at least at the season indicated, have been wholly negative.

'3. From observations made in the various groves where the fungus has been disseminated commercially, there is absolutely no evidence, thus far, to show that the fungus has been of any importance whatever in checking the scales.

'4. Where natural conditions are favourable for the development of the fungus, as in the districts contiguous to the coast in Santa Barbara County, the Isaria will kill more or less of the black scale, but the field where it would thrive cannot be greatly enlarged, if at all, by attempts at artificial dissemination.

'5. From our recent experiments and observations as well as general observations made on this fungus since 1908, the writers feel justified in extending to citrus growers no hope that this fungus will keep their trees free from the black scale.'

W.N.



FLORA OF JAMAICA, by W. Fawcett, B.Sc., F.L.S., and A. B. Rendle, M.A., D.Sc, F.R.S., F.L.S. Vol. 3. Dicotyledons (Piperaceae to Connaraceae) xxiii + 280 pages with 113 text illustrations and 5 plates. *London: Trustees of the British Museum*, 1914.

This is the second volume to appear of this admirable work. Volume I, Orchidaceae, was published in 1910, Vol II, completing the Monocotyledons, is not yet issued. It is estimated that the Dicotyledons will require three more volumes, making six in all.

The order of families followed is that of Engler, and the present volume includes thirty-eight natural orders, with analytical keys to and descriptions of families, genera, and species. An illustration of each genus is given, usually as a line drawing in the text. A list of references and synonyms is given for each species. The larger West Indian families included in this volume are Piperaceace, Moraceae, Urticaceae, Loranthaceae, Polygonaceae, Amarantaceae and Lauraceae.

It is sufficient to say that the work is indispensable to botanists working in the West Indies, and apart from its primary purpose it will afford welcome relief to beginners in the study of the West Indian flora by serving as a key to the comparatively uncharted pages and ancient terminology of Grisebach.

The Jamaican Government is to be congratulated on the service rendered to botanical science in affording facilities and financial help for the production of the Flora, and further upon its good fortune in having the services of so happy a combination of authors made available for the purpose by the British Museum authorities.

W.N.

JAVANESE COFFEE AND THE GOVERNMENT.

In a recent issue of the *Agricultural News* we reproduced an extract from Dr. Copeland's Report on a visit to Java published in the *Philippine Agriculturist and Forester* for April 1915. The following is another extract dealing with the subject of coffee. It shows how the Javanese authorities have in the face of difficulties saved this industry from extinction, and later brought it up to a position of great economic importance. Dr. Copeland's remarks centre principally around the subject of disease. He says:—

The coffee rust attacked Java several years before it reached the Philippines, and absolutely nothing but the difference in the two Governments is responsible for the fact that Java has still an exceedingly important and profitable coffee industry, while that of the Philippines has been dead for the past twenty-five years. The Javanese Government met the coffee rust promptly with a fight by means of fungicides, by selection of the most resistant plants to be found locally, and by the importation of every other kind of coffee which could be found in the world. The result is that the various species of coffee which are now being experimented with at Los Banos, and in almost every other similar institution in the tropics, have all been brought to our attention by the Government of the Dutch Indies. The first of these to show great promise was Liberian coffee. This was widely heralded as a rust-resisting species, and was extensively planted in Java, and to a lesser extent in many other parts of the Old World tropics. It developed after a time that the quality of the marketed Liberian coffee was such that it could only be raised with a profit where labour is exceedingly cheap, and that even here it was at a serious economic disadvantage. The Dutch Government met this difficulty by a careful study of methods of preparation, with the ultimate result rather recently obtained, and for which, although I have myself made a considerable study of the subject, I was absolutely unprepared, that the Liberian coffee produced in Java is now being marketed at a price above that of the Arabian coffee for which Java itself is so famous.

A wholly new and unexpected difficulty then presented itself. The Liberian coffee began to be attacked by rust, and these attacks increased in virulence year by year, until the coffee rust of Java now attacks Liberian coffee with approximately the same violence as Arabian. This is at the same time a matter of prodigious practical importance, and a fact of the utmost scientific interest. Neither the coffee nor the coffee rust is native in Java. It is practically impossible that the rust which now attacks the Liberian coffee should be anything else than a descendant of the rust which was formerly able to attack Arabian coffee but not Liberian. In other words, the pest has in the course of a number of years developed wholly new properties. Uninfected Liberian coffee has been exported from Java and raised elsewhere, and found immune to the rust of the other regions. At the same time, new importations of Liberian coffee, immune to rust in the places of origin, have been brought into Java and promptly attacked. Now the ability to live on a particular host is in very many cases regarded as a good specific character of a fungus. It can accordingly be regarded as definitely established that there has been developed in Java during the last twenty-five years a fungus of known parentage, but which now has characters specifically different from those of the parent coffee rust of Ceylon. This is the most satisfactory case known to me in the whole realm of science, of the evolution of a new species from a known parent within a definitely known length of time, and under conditions which are a matter of satisfactory record.

Attention has been given by the United States Department of Agriculture to the botanical characters of the leaves of the date palm for the purpose of distinguishing cultivated varieties. The observations obtained are published in *Bulletin No. 223* of the Bureau of Plant Industry. In measuring the angles at which the leaves are set, a special protractor was used, and the whole investigation was almost entirely mechanical as might be expected on account of the very symmetrical arrangement of the leaves of the date palm. The microscopic characters of the leaves is not touched on.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, August 10, 1915.

ARROWROOT—2¼*d.* to 4¾*d.*
BALATA—Sheet 2*s.* 4½*d.*; block 1*s.* 10*d.*
BEESWAX—No quotations.
CACAO—Trinidad, 80/- to 83/- per cwt.; Grenada, 75/- to 80/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—£23 10*s.* per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Jamaica, 55/- to 75/-.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 3/8 to 3.9; concentrated, £25; Otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations.
MACE—9*d.* to 2/11*d.*
NUTMEGS—4¼*d.* to 5¾*d.*
PIMENTO—No quotations.
RUBBER—Para, fine hard, 2/4¾; fine soft, 2/2¾; Castilloa, 2/2¼.
RUM—Jamaica, 2/5.

New York.—Messrs. GILLESPIE BROS. & Co., July 28, 1915.

CACAO—Caracas, 16c. to 16½c.; Grenada, 16½c. to 16¾c.; Trinidad, 16½c. to 17c.; Jamaica, 14c. to 14½c.
COCO-NUTS—Jamaica and Trinidad selects, $23·00 to $24·00; culls, $13·00 to $14·00.
COFFEE—Jamaica, 7¾c. to 11c. per ℔.
GINGER—12½c. to 16c. per ℔.
GOAT SKINS—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 38c. to 40c. per ℔.
GRAPE FRUIT—Jamaica, $1·50 to $2·25.
LIMES.—$2·50 to $3·00.
MACE—47c. to 51c. per ℔.
NUTMEGS—11c. to 11½c.
ORANGES—Jamaica, $1·75 to $2·00.
PIMENTO—3¼c. per ℔.
SUGAR—Centrifugals, 96°, 4·83c. to 486c.; Muscovados, 89°, 4·18c. to 4·21c,; Molasses, 89 , 4·05c. to 4·08c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., August 9, 1915.

CACAO—Venezuelan, $16·75 to $17·30; Trinidad, $16·75 to $17·25.
COCO-NUT OIL—86c. per Imperial gallon.
COFFEE—Venezuelan, 13c. to 14c. per ℔.
COPRA—$3·60 to $3·75 per 100 ℔.
DHAL—$7·00.
ONIONS—$1·20 to $2·50 per 100 ℔.
PEAS, SPLIT—$12·00 per bag.
POTATOES—English $2·25 to $2·50 per 100 ℔.
RICE—Yellow, $5·80 to $6·00; White, $5·60 to $5·75 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. T. S. GARRAWAY & Co., August 9, 1915; Messrs. JAMES A. LYNCH & Co., Ltd., August 7, 1915.

ARROWROOT—$4·00 to $4·60 per 100 ℔.
CACAO—$14·50 to $15·00 per 100 ℔.
COCO-NUTS—$16·00.
HAY—$1·70 to $1·90 per 100 ℔.
MANURES—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia, $85·00 to $90·00 per ton.
MOLASSES—No quotations.
ONIONS—$3·00 to $4·25 per 190 ℔.
PEAS, SPLIT—$12·00 per 210 ℔.; Canada, $5·40 per 120 ℔.
POTATOES—Nova Scotia, $2·50 to $2·75 per 160 ℔.
RICE—Ballam, $6·00 to $6·10 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $5·77.

British Guiana.—Messrs. WIETING & RICHTER, July 24, 1915; Messrs. SANDBACH, PARKER & Co., August 6, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	$10·00
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	14c. to 15c. per ℔.	16c. per ℔.
CASSAVA—	$1·44	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$10 to $15 per M.	$18 per M.
COFFEE—Creole	——	14c. per ℔.
Jamaica and Rio	14c. to 15c. per ℔.	14½c to 15c.
Liberian	10c. per ℔.	10c. per ℔.
DHAL—	$8·00	——
Green Dhal	——	——
EDDOES—	$1·68 to $3·00	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	4c. to 5c. per ℔.
Madeira	3¾c.	——
PEAS—Split	$12·00 to $12·50	$13·00 to $14·00 per bag. (210 ℔.)
Marseilles	——	——
PLANTAINS—	20c. to 48c.	——
POTATOES—Nova Scotia	$4·00	$4·00
Lisbon	——	——
POTATOES--Sweet, B'bados	$1·44	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
TANNIAS—	$2·40	——
YAMS—White	——	——
Buck	——	——
SUGAR—Dark crystals	$3·75 to $3·85	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

A FORTNIGHTLY REVIEW
OF THE
IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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The Organization of Science.

FOR over twelve months Great Britain has passed through experiences of unparalleled intensity, and this, in certain respects, has had a most revolutionary effect upon practical politics in that country. One of the most noticeable and important changes is the new attitude towards science and scientific workers. For the first time in the history of the country chemists, physicists and biologists are in active demand. Their work is no longer regarded as outside the sphere of national affairs; indeed its indespensable character has been so forcibly driven home by the war that a general mobilization movement has been set on foot, not only to focus scientific effort upon the immediate conduct of the war but also upon the progress of British technical industries in time of peace. The Government, so far as the war is immediately concerned, has appointed Invention Boards at the Admiralty and at the Ministry of Munitions, both of which include leading scientific experts. But the most significant move has been made by the Royal Society and the Chemical Society. These influential and representative bodies have presented a memorial, and have sent a deputation composed of the most eminent chemists to the Government, both procedures having been accorded a highly satisfactory reception. The substance of both the memorial and interview was an appeal to the Government to assist in giving scientific support to certain industries that have been seriously affected by the war. It was urged that the main causes of the backward state of certain industries are (1) failure to realize that modern industry, to be successful, must be based on scientific research; and (2) want of more intimate association between the manufacturers and the workers in science. It was urged that a central national organization should be created—a kind of science 'clearing house'—and that the State should encourage research by providing money for that purpose. All of these suggestions were favourably received. In the words of the President of the Board of Education: 'Action must not be hurried, but it must be taken at once, and though there will not be much money this year, it is hoped that when the war is over substantial sums will be forthcoming.'

The extent to which the manufacturer will fall into line with this organization of science is a matter which will be determined largely by the pressure of

circumstances. In the past he has not been anxious to discuss his problems with external advisors. The general custom has been to employ the services of an individual expert. But these experts, in spite of their good work, have not been accorded administrative powers and have often been handicapped as regards contact with other investigators on account of trade secrets. The advent of the man of science as an industrial administrator, which is really what England is calling for, and which characterizes German industry, will necessiate a change of attitude on the part of the manufacturer. Science and the Government realize this to the full and are prepared to fulfil their functions in this and other respects. It only remains for the third party to fall into line, and then we may look to new and great developments.

Before proceeding to consider organization of science in relation to agriculture, it will prove instructive to enquire why science has not before now received in England due recognition. The reasons are to be found principally in the British character. One ingrained characteristic is an appreciation of mechanical invention without any appreciation of the scientific research underlying it. It is not realized that the inventor is, in a sense, parasitic on science; that he obtains his ideas from science, and simply serves them up in a concrete form for popular consumption. If the basic importance of research were more fully understood and recognized by the manufacturer, he would be more prepared to encourage science, and able men would be more prepared to participate in it.

Another reason for the lack of recognition is the attitude of the older Universities and the English Public Schools. By them science as a profession is looked upon as one lacking in the essentials of refinement, and there can be no doubt this social stigma has had much to do with keeping able men of good position from entering it. Law and the Church, on the other hand, have always enjoyed high approval, one reason being no doubt that in these professions the ultimate prizes to be gained in after life are vastly superior. They are, however, limited in number, and as Sir William Tilden remarked at the deputation to the Government already referred to, 'a large proportion of able young men who might otherwise take up chemistry as a pursuit are led into the ranks of other professions, especially the Law, in which there are prizes for the few but disappointment for the vast majority.'

Although we have seen that science in British industries has lacked recognition and organization, it has manifestly achieved a great deal. Now, if we consider science in relation to agriculture we find that without organization practically nothing can be done. Hence in the application of science to agriculture, we find that organization is, in most countries, much more advanced. It would seem that an industrial parallel to a Department of Agriculture such as that possessed by the United States is what is wanted in England as regards her industries. It is because Germany has both her manufactures and agriculture organized in this way that she has been economically so powerful. Here a word of warning may be introduced in regard to the possible neglect of science in relation to British and Colonial agriculture in the general move to help the manufacturer. Although in many respects the organization of science in agriculture is efficient there is still much room for development, especially in regard to the provision of research facilities. Furthermore, in British Colonial agriculture, a centralized body of technical administrators is much needed to consider policies of development which the lay official is not in a position fully to understand. Reference may be made in this connexion to the United States and Holland, countries which have accomplished a great deal in the Philippines and Java, respectively, by means of such an arrangement.

Turning now to the West Indies, it will be realized that the great national movement described as taking place in England affords a lesson that may be taken to heart in these islands. Considering the natural difficulties of communication, science in relation to agriculture is in a very creditable condition of organization, yet there are still ways in which improvement could be effected. There is need for closer and more intelligent contact between the planter and scientist, and need also for greater intercourse between the investigators themselves. The former should arise in the course of time as the natural result of educational efforts which have a fundamental influence upon the organization of science in general; the latter is accomplished by the holding of conferences, which in the case of the West Indies at the present time is impracticable on account of the war.

Finally there is a tendency in the West Indies, like the one in Great Britain, for able young men to neglect science and agriculture as a profession, in preference to Law and Commerce. This war will mean a renaissance of science throughout the Empire; and if the prospects before a scientific career have in the past been discouraging, there is a great possibility, if all goes well, that in the future the outlook will be a most attractive one.

ST. LUCIA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1914-15.

The St. Lucia Agricultural Department conducts its official and experimental work at two establishments, namely, at Réunion in the Souffrière District, which is the principal establishment, and at the Botanic Gardens in Castries near which the Government Lime Juice Factory is situated. The report under review begins with a descriptive account of the work done in these gardens and certain observations on plants. Recent plant importations have included several species of Eucalyptus, and amongst the more economic plants, seeds of Sesamum from Grenada, seeds of varieties of ground nuts from Montserrat, and 100 suckers of 'Red Spanish' and 'Smooth Cayenne' pine-apples from Florida. The notes on economic plants which follow, refer to the recent determination of a coniferous tree found growing on the Petit Piton as *Juniperus barbadensis*. It is of interest to record that a large number of plants of this tree have been planted at the Réunion Experiment Station, as well as specimens of *J. bermudiana* and *J. pachyphloea*. As well as these trees, a large number of *Casuarina equisetifolia* have been introduced and planted to serve as a supply of cordwood. Considerable quantities of mahogany have also been established at Réunion.

The section dealing with the work at Réunion itself shows that the distribution of plants has rapidly increased during the past four years from 28,000 to nearly 70,000. As well as the raising of seedlings, the experimental plots represent useful work carried on at this station. Fifteen acres of coco-nuts have been established for experimental purposes and two $\frac{1}{2}$-acre plots of Sea Island cotton were sown as a catch crop between cane banks. It is concluded that June and July are the best months for sowing cotton in the Choiseul district. Other experiments have included those with cassava and vanilla.

Information on progress in the chief industries shows that while the exports of sugar and cacao have somewhat decreased, the shipment of lime products has again this year undergone a marked extension. Beginning with shipments valued at only £127 in 1906, the exports of lime products from St. Lucia have risen to a value of £6,451 in 1914. As a general rule the condition of lime plantations is reported to be good, but some of the earlier plantations are now showing the ill effects of too close planting. Along with lime cultivation that of coco-nuts has also shown progress. It is stated that the extension under this crop has taken place at such a rate that coco-nut planting can no longer be regarded as a minor industry in St. Lucia. The export of coco-nuts for the year under review shows a reduction, but this decrease can be explained by the fact that a large number of locally produced nuts have been used for planting up fresh estates. In future it is likely that there will be a steady increase in the shipment of copra.

On page 9 of the report appears a table giving the quantity and value of the various exports from St. Lucia during 1914. Sugar products still head the list with a value of £46,279; cacao comes next valued at £38,846, then lime products valued at £6,449, and coco-nut products valued at £470. The logwood exported was considerable, being valued at £2,275.

The report on instruction in agricultural matters deals principally with the working of the primary schools, the agricultural side of which is examined annually by the Agricultural Department. The examiner's report shows that good work has been done during the year and that the teachers are to be congratulated on the standard attained. Further educational efforts of the department have been connected with the island's representation at exhibitions, notably at the International Rubber and Allied Products Exhibition held in London in June 1914. The display of St. Lucia produce was favourably reported on by the Secretary of the West India Committee.

A special line of investigation started during the year has been the collection and identification of the St. Lucia grasses. The Agricultural Superintendent has received valuable assistance in this work from Mr. A. S. Hitchcock, Systematic Agrostologist of the United States Department of Agriculture, who kindly undertook to identify any species unknown locally. A provisional list of the grasses appears in this report, and general notes are furnished on the economic importance of the more valuable ones. Thus *Paspalum dilatatum* (water grass) is described as a coarse grass which is relished by cattle. Grazing stock also relish *Axonopus compressus*, which is frequently found occurring in patches on lawns and pastures. It makes a good springy turf if kept out. Concerning *Andropogon pertusus* (Barbados sour grass), it is stated that this is most suited for dry regions and is more valuable as a hay grass than as a green fodder. *Cenchrus echinatus* (burr grass), although troublesome to pedestrians at its fruiting period is nevertheless a most valuable pasture grass in its young stage. It constitutes one of the hardiest grasses found in pastures along the dry coast lands. It will withstand the severest drought and the hardest grazing, and thrives in the poorest soils.

One of the most important subjects dealt with in the report is the working of the Government Lime Juice Factory. Notes are given concerning milling, concentration, and distilling. It is shown that a high standard juice with a sediment test not exceeding 5 per cent. can be regularly turned out by any of the steam boiling plants in St. Lucia, as against the usual juice with 20 to 30 per cent. of sediment characteristic of the open-vat method of concentration. Interesting figures are given concerning the cost of manufacturing concentrated lime juice. It appears that about £2 10*s.* may be taken as a representative estimate, though under war conditions an increase of some 12*s.* to 14*s.* has to be added. It may be mentioned that in connexion with the Government Lime Juice Factory, planters are provided with facilities for having their concentrated juice tested, a fee of 1*s.* being charged for each examination of raw juice and 1*s.* 6*d.* for concentrated juice.

The highest recorded rainfall for the year was 120·15 inches at Uplyme and the lowest at Vieuxfort, which was 27·78 inches. The rainfall at Réunion for the year 1914 was 50·45 and rain fell 197 days out of the 365.

Appended to the major portion of this publication is a report by the Agricultural Superintendent and Land Officer on the working of the Land Settlement Scheme at Réunion. The total area of the settlement is 165 acres. Of these, twenty-nine lots have been sold, comprising 101 acres of a total value of £709 0*s.* 6*d.* Several of the remaining lots have been applied for and the sales will probably be completed shortly. Both the agricultural and financial conditions of the Settlement appear to be in every way satisfactory.

SUGAR INDUSTRY.

SUGAR POSSIBILITIES IN BRITISH GUIANA.

An article on the resources of British Guiana by Professor Harrison and Mr. C. K. Bancroft in the *Bulletin of the Imperial Institute* (Vol. XIII, No. 2) contains the following references to sugar which will no doubt interest many of our readers:—

The sugar industry is by far the most important industry of the colony, and sugar, with its by-products rum, molasses, and molascuit, contributes almost 75 per cent. of the total value of the exports. About 33 per cent. of the wage-earning portion of the population are directly connected with the sugar industry, while if those indirectly connected are included, the proportion is in excess of 50 per cent. of the population.

Of the empoldered area of the colony 44·7 per cent. is under sugar cultivation. About 85 per cent. of this is reaped each year. This indicates that in round figures 38 per cent. of the empoldered land contributes to the yearly production of sugar. The average production of sugar over the colony during normal years is about 1·8 tons of sugar per acre. On well-administered, suitably equipped, and satisfactorily financed plantations the average yield in fair years may be taken as 210 to 220 tons of sugar per acre per annum.

A conservative estimate of the area of land well suited for sugar cultivation, in the districts from the mouth of the Pomeroon in the north-west to the west bank of the Corentyne river in the east, is 531,000 acres, exclusive of the area already empoldered on sugar estates. Sixty-four thousand acres of this may be already beneficially occupied by products other than sugar, leaving nearly 470,000 acres available for the extension of sugar cultivation. At the present proportion of land yearly cropped with sugar to the total empoldered area, this would give in round figures 178,000 acres to be reaped each year, yielding a mean crop of 320,000 tons of sugar.

Given sufficient capital, labour, progressiveness, and enterprise, the colony's sugar crop on its eastern area could be increased to 570,000 tons of sugar per annum, which by fully applying modern scientific methods in cultivation and manufacture might be raised to 700,000 tons. Inclusive of the vast north-western section on the coastlands and along the lower reaches of the rivers of British Guiana, the total area of easily accessible land presumably well suited for sugar-cane cultivation, and at present not otherwise beneficially occupied, amounts in round figures to 1,620,000 acres. The area, if fully planted and reaped under modern conditions of cultivations and manufacture, could yield from $2\frac{1}{3}$ to $2\frac{1}{2}$ million tons of sugar per annum.

PROBLEMS IN THE CHEMISTRY OF SUGAR.

In a paper read before the section of agricultural chemistry of the American Association for the Advancement of Science, at San Francisco, on August 5, 1915, Dr. C. A. Browne gave a most interesting review of the various agricultural, technical and biological questions that are at the present time receiving very widespread and thorough investigation by sugar chemists. The paper is reproduced in the *Louisiana Planter* for August 7, 1915, from which source the following abstract has been prepared.

It should be pointed out from the first that the author, owing to the wide nature of his subject found it desirable to survey the different phases with more or less special reference to the work of chemists in the United States. This does not detract however from the value of the review as an outline of the kind of work which is being done in other parts of the world.

The first aspect of the subject dealt with is the study of the occurrence and distribution of sugar in the vegetable kingdom. It is mentioned that the more recent methods of detecting sucrose, as for example by means of the enzyme invertase, have greatly helped to widen our knowledge of the distribution of sucrose, and scarcely a month passes, without mention of some new plant in which sugar has been discovered. A closely related, but far more difficult problem is the one concerning the function of sucrose in the economy of plant life. In the metabolism of carbohydrates the law of equilibrium is referred to as a governing factor, and it is mentioned that the investigation of this part of our subject would be enormously helped by the discovery of a reliable micro-chemical test for sucrose. The importance of such a test will be appreciated when we consider that practically everything known about transitory starch has resulted from the well-known micro-chemical test with iodine.

The effects of climatic and other conditions upon the sugar content of plants present another class of interesting problems, and in this connexion mention is made of the work of Wiley. For many years the effect of changing conditions upon the sucrose content of cane has been investigated, especially in Hawaii.

The problem of improving sugar-producing crops is always before the agricultural scientist. Dr. Browne puts forward the opinion that we have now reached the limit to the chemical improvement of our sugar-producing plants. It is doubtful if the laws of osmotic equilibrium will permit the accumulation of sucrose in the cane or beet to exceed a certain maximum, which with normal conditions probably does not exceed 25 per cent. Occasional analysis has been reported of canes and beets exceeding 25 per cent. sucrose, but such cases are unusual and nearly always the result of drought, or of other abnormal conditions.

Turning from the agricultural to the technical side of sugar production Dr. Brown refers first to the change of opinion as regards the economical working of the factory. At the present day the aim of the successful sugar house chemist is not necessarily, as it was in the past, to secure the highest possible yield of extracted sucrose, but rather to secure that degree of extraction which is most advantageous from the financial and the economic points of view. A sugar factory, says Dr. Browne, operated at the highest degree of chemical efficiency may be a complete failure financially. Many thousands of dollars were wasted recently in equipping certain sugar-cane mills with diffusion batteries for the purpose of extracting the last traces of residual sucrose from the megasse. While the extraction of sucrose from the cane by this means was perfect, the increased cost of the operation and the injury of the megasse for fuel purposes caused the process to be quickly abandoned. Another point bearing upon the same idea is in connexion with the demand for molasses. If a rich grade is required it often pays to reduce extraction, allowing excess of sucrose to remain in the molasses which are then used for feeding.

The enforced idleness of beet and cane sugar factories for six to ten months of the year is a most serious economic loss, and to secure some relief from such a situation is one of the most pressing problems to sugar production. It is suggested that efforts should be made to extend the working season by devising better methods for preserving the sugar crop after harvesting. A somewhat promising solution of the problem consists in desiccating the cane or beet and

preserving the dried material until it is needed for extraction.

The equipment of factories for the direct manufacture of white sugar from the cane is a chemical problem which is being much discussed at present. Recent advances in the study of clarification have now made it possible to manufacture very fine grades of white sugar directly from the juice of the cane. The production of a white marketable sugar which can be stored for any period of time without loss, offers a most satisfactory solution to the problem of deterioration, and thus enables the producer to hold his product for the most favourable time of selling. In connexion with white sugar, the problems of clarification are exceedingly important. Among the new clarifying substances which are being studied should be mentioned various hyposulphite preparations and infusorial earth. New decolourising agents of high carbon content, such as Norit and Eponite are also being investigated both as to their use in refining and in making white sugar upon the plantation. Recent experiments show these new charcoals to be vastly superior to bone black in decolourising power.

New uses are being discovered each year for the employment of sugar in the arts. The utilization of the waste sucrose in sugar factory residuums presents each year some new unexpected feature. The employment of molasses for the production of industrial alcohol, for the manufacture of mixed cattle foods, and for many other purposes has so increased that the subject of molasses is forming a very specialized branch of sugar chemistry. Mention is made by Dr. Browne of the recent use made of sucrose in Germany for the growth of yeast which can then be used as cattle food. Reference to this subject has already been made in the *Agricultural News* in some detail, but it has not been mentioned that a feature of the process is that the urine of cattle can be used as a source of nitrogen for the yeast. In the nitrogen cycle urea-protein in the yeast and protein-urea in the animal is thus an endless one.

Turning to efforts that have been made to synthesize cane sugar, Dr. Browne gives an interesting historical account of the work that has recently been accomplished. The goal aimed at has however not yet been gained, yet the synthesization of sucrose is a poblem worthy of the best efforts, and its accomplishment will rank as one of the greatest triumphs of organic chemistry.

Lastly, attention is given to the improvement of methods for estimating sucrose. The polarization of sugar products is performed at present very much as in the day of Soleil seventy years ago. Yet this most simple of analytical operations presents a large number of problems which still await solution, as for example the volume of precipitate error in clarification. Finally mention is made of Clerget's method, which is described as the most beautiful perhaps of the many contributions of French genius to sugar analysis. It is stated that this method in principle is ideally perfect, but from a practical point of view it is still being investigated, and the questions involved are so complicated that the subject may always be expected to come up for discussion.

The cultivation of seaweed as a source of manurial potash is described in a note in the *Bulletin of the Imperial Institute* for April-June 1915. This is being carried on in certain parts of Ireland. The price per ton of the weed in 1913 was about 15*s* to 16*s*. but at the present time owing to the enforced demand for potash higher prices are being obtained. The cultivation of seaweed has also received considerable attention in the United States, particularly on the Pacific Coast.

A NEW SACCHARIMETER.

One of the many optical instruments which the English opticians have allowed the Germans to supply almost entirely is the saccharimeter. This instrument used to be made by Browning, but in late years nearly every instrument purchased in England has come from Berlin from the firm of Schmidt and Haensch, who make several designs of large and small instruments. It is therefore a pleasure to find an English firm—Messrs. Bellingham and Stanley, of London—making a saccharimeter which introduces valuable improvements on the German design. The one to which we refer is of the half-shadow type with quartz compensating wedges, but instead of the usual long wedge of which the movement is read direct by a scale and vernier, this one has a short wedge of larger angle. The wedge is moved by a screw, and the movement is read on a large drum with an open scale and sliding pointer. The whole length of the scale is some 2 feet instead of $1\frac{1}{2}$ or 2 inches, and it can thus be read with great ease.

In instruments making use of a quartz wedge of the usual length (about 3 cm.), the scale is nearly always uneven, and unless calibrated, introduces errors amounting to several tenths of a degree Ventzke. According to Landolt this is due to the quartz, which he describes as 'a poor material optically;' he says that one seldom finds faultless plates, and that a pure wedge 3 cm. long is rare. Hence the value of the short wedge of Bellingham and Stanley which is less than half the usual length. The advantage of such a wedge, even if the quartz is not of special quality, is greater than would appear at first sight, since the field is due to the *average* effect of the whole of the light passed through the wedge, and this average will vary evenly through the small change of area of the wedge due to its movement, and thus the scale will be regular in spite of variations in the quartz; also it is easier to get repeated readings, owing to the greater ease with which the setting can be made with the fine adjustment given by the series, as compared with the usual rack and pinion motion. In fact, the makers state that they have not detected any calibration errors in their instruments. Another valuable feature is the enclosure of the scale and all working parts, so that they are protected from the salt vapours. The importance of this needs no emphasis to those who have had experience with instruments of this character. The corrosion of the metal work—especially steel work—and of the scale, when as in the higher priced instruments this is engraved on silver or nikelin, under the action of the fumes in a laboratory often renders the instrument almost unusable in a few years. The instrument is mostly constructed of an aluminium alloy, protected by a black-stoved enamel, and no steel is used except for a small spring, which is entirely enclosed.

The optical work is of the first quality. The dividing line is sharp and clean, and the field evenly illuminated, so that adjustment for equality can be made without ambiguity, and with corresponding accuracy. The makers calibrate the scale at a number of points by direct reading against a polariser rotated on a divided circle. In the instrument examined the divisions were in half degrees 'Ventzke' (of which 100 correspond to 34·68° of arc, for sodium light at 17·5°C.), and it was easy to estimate to tenths of a degree, i.e., to less than three minutes of arc. The design and workmanship were all that could be desired. The same firm is also making refractometers of the Abbé and Pulfrich type and other optical instruments. (*Nature*, July 29, 1915.)

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date August 23, 1915, with reference to the sales of West Indian Sea Island cotton:—

There has been a little business done in West Indian Sea Island cotton since our last report; the sales amount to 100 to 150 bales; they include St. Vincent 18*d*. to 20*d*., with a few bales of superfine at 30*d*.. and a few Nevis and Montserrat of the best quality at 15*d*. Prices are steady.

BRITISH COTTON GROWING ASSOCIATION.

The one hundred and thirty-eighth meeting of the Council of the British Cotton Growing Association was held at the Offices, 15 Cross Street, Manchester, on Tuesday the 3rd ultimo. The President, The Rt. Hon. the Earl of Derby, K.G., occupied the Chair.

Reference was made to the loss which the Association had sustained by the death of Mr. F. Reyner, and it was decided to send a letter of sympathy to his family.

WEST AFRICA. The purchases of cotton in Lagos to July 31, amounted to 5,108 bales as compared with 13,267 bales for the same period of last year, and 13,284 bales for 1913.

The rainfall this season in Lagos for the first time for some years has been ample, and as all foodstuffs have now been planted there is a possibility that the 1916 cotton crop will be a large one, more especially so as there has been a considerable reduction in the buying price of most other products as compared with the price of cotton.

SUDAN. The total crop from the Sudan this season will amount to over 24,000 bales, valued at about £300,000. The Association have given a great deal of assistance in financing and handling the crop. The yields at the Experimental Stations on the Gezira Plain during the past season amounted to over 450 lb. of lint cotton per acre, which is a very satisfactory result.

UGANDA. Owing to the necessity of planting large quantities of foodstuffs, it is likely that the production of cotton will be restricted for some time. During the past season the Association have been paying the natives the highest price possible for their cotton, otherwise there would have been a much greater reduction in the acreage under cotton.

During the month sales have been made of 3,356 bales of the Association's cotton, which was considered very satisfactory under the present conditions.

It has often been represented that cotton is a new industry in Jamaica, whereas it is older than the sugar industry, the aborigines of Jamaica having been growers and manufacturers of cotton. The history of cotton in this island is not without bearing on the present situation. Older experiences indicate that the industry was alone profitable in Jamaica when perennial tropical cottons of medium staple were cultivated as by the Arawaks. In 1793 Bryan Edwards described cotton as a staple crop of Jamaica, while Macfadyen in his 'Flora' described the cotton formerly grown here as a perennial plant that seldom came into bearing until the second year.

LARGE YIELDS OF CAUTO COTTON IN JAMAICA.

Reference was made in the *Agricultural News*, for December 5, 1914, to Cauto cotton in Jamaica, where it is stated that plots established at Hope in August 1913 gave a crop of cotton in January to March of the next year amounting to about 600 lb. of seed-cotton per acre. The lint was valued at 8*d*. per pound in London and at 16c. to 17c. in New York.

The latest issue of the *Bulletin of the Department of Agriculture*, Jamaica, goes on to say:—

A plot of 50 acres was established on honeycomb rock lands in lower Clarendon and this grew well and gave a return of 700 lb. of seed-cotton for the first crop. Despite the serious drought of the summer of 1914 the plants ratooned successfully and gave 50 bales of cotton in the early part of 1915. The plants at the Experiment Station at Hope were tested in various ways with regard to pruning and it was found that they stood hard pruning in a remarkable manner and rapidly sprang again into new growth.

The unpruned plants were a good deal damaged by scale, and most of the old plants were cut back in September on this account. Those that escaped scale attack and were left unpruned gave a return of 900 lb. of seed-cotton per acre.

All the August sown plants of 1914 and the late cut-backs of 1913, however, lost their crop in March owing to 'boll rot'.

Fundamentally due to climatic influences, the Microbiologist traced the injury to infection of the bolls through the punctures of cotton stainers functioning as a means of access to the interior of the bolls by the organism causing the 'rot'.

As Sea Island and Egyptian cottons were equally affected by this trouble, under similar conditions, it must be regarded as due to the climatic conditions and not to a peculiar susceptibility of cauto cotton.

All the plants at Hope were cut back in April and sprayed with lime-sulphur wash as a precaution and are now in fresh and vigorous growth.

If 'Cauto Cotton' can provide us in Jamaica with a perennial cotton capable of giving returns over a series of seasons without the risk of an annual planting it should prove a valuable economic plant, while its remarkable growth on the arid limestone area in lower Clarendon indicates that it can be grown successfully on these lands which, so far, have been useless for purposes of cultivation.

Botanical specimens of the plant in all stages were prepared by Mr. W. Harris, F.L.S., and on submission to Kew were determined to be a new variety of cotton to which the name *Gossypium brasiliense*, var. *apospermum* (Sprague) has been assigned. This places it as a clean-seeded form of our common wild 'Kidney' cotton.

In connexion with the use of certain plants for hedges for protecting fields and gardens in the West Indies, the name of *Calliandra tergemina*, a native plant of Dominica, known locally as the Bois Ravine, might be added to the list already given in the *Agricultural News*.

This plant does not possess spines, but the growth is rapid and dense and it is highly suitable for ornamental hedges in gardens. It flowers freely several times during the spring, at which time it is a most showy object. Owing chiefly to its ornamental appearance this plant is now being used for hedges in the Dominica Botanic Gardens.

THE EFFECT OF TAPPING ON THE PARA RUBBER TREE.

Mr. L. E. Campbell, B.Sc., A.I.C., rubber research chemist to the Ceylon Department of Agriculture, is the author of Bulletin No. 16 of that Department, which describes an investigation on tapping and the storage of plant food in *Hevea brasiliensis*. From the results described it may be concluded that the effect of careful tapping is localized.

Starch is withdrawn from the wood immediately behind the cut, and also partially from narrow zones of bark below and at each side of the tapped area. In the above cases these zones did not exceed 1½ inches in breadth, and in most cases the breadth was considerably less than this. The starch content of the bark was, however, normal right down to the top of the tapped area in the majority of cases.

Excepting for this slight and absolutely localized withdrawal of starch in the neighbourhood of the tapping cut, the food supply had not disappeared from below the tapped area.

It must be understood that all the trees selected for these experiments had been carefully tapped, and on examination of the sections during microscopical work evidence of 'kiams' was extremely rare.

In hardly any case had the tapper cut down to within 1 millimetre or $\frac{1}{25}$-inch from the cambium. It is probable that food transport from the leaves takes place largely within this inner layer of the bark, and it is this fact which is so often lost sight of in discussions on the subject. Because a given tree with bark 8 millimetres thick at a given place is tapped so that 7 millimetres of the 8 are removed, to say that it is 'seven-eighths girdled' at that place gives a totally wrong impression, the 1 millimetre remaining being the chief part of the system for the conduction of food down from the leaves.

Where careless or heavy tapping has been employed, the tapping out extends down to, or nearly down to, the wood, and there is, of course, a complete severence of the channels of food transport at that place. It is unfortunate, from the planter's point of view, that the latex vessels occur to the greatest extent near the cambium, but the iniquity of cutting 'kiams' is now usually sufficiently strongly impressed on the coolie.

The conclusions may be summarized by stating that the effects of tapping on the trees here described were almost purely local, a result which a perusal of most of the literature on the subject would not lead one to expect.

Now the premises are that intervals between periods of tapping are of great advantage as regards recovery of the bark. This has however to be reconciled with the not unnatural desire of directors and proprietors to obtain large rubber yields.

The fact that the effects of tapping appear to be largely local, especially in a horizontal direction, justifies the surmise that by changing tapping from one part of the tree to another at intervals, the resting period of each area so tapped is nearly as effective as if the whole tree were rested.

It would seem that the 'change-over' system so regulated as to accord with estate practice would be of benefit as regards bark renewal, and probably of rubber yield.

Another point of interest is that the effects of tapping here observed are much more localized than the remarks of Fitting would lead one to believe. It does not follow, of course, that some methods of tapping may not be so drastic in their action as to have a much more widespread effect on the trees than those described here, or, again, that bad tapping might not lead to such effects. Indeed, it is possible that results such as Fitting obtained might have been due to this cause.

It has also been suggested that Fitting's results may have been abnormal owing to the possibility that his trees were examined about the time of the wintering season, though the effects of the wintering season on the food movements of Hevea have not been hitherto investigated.

The Role of Chlorophyl.—A series of four maize plants were cultivated in solutions which, for the first two acting as controls, were of ordinary strength, and for the last two ten times as strong, approximately 3·4 parts of soluble elements per 1,000. The amount of water evaporated by each plant was measured, and on the twentieth day this loss of water was made good by addition of the respective culture solutions, the strength for plants 3 and 4 having reached approximately 6·2 parts per 1,000. From this date, these two plants began to lag behind the controls, and six days later the terminal leaves of plant 4 were chlorotic. Comparing one control and one experimental plant, it was found that on the twenty-fourth day the control evaporated twice as much water as the other, the expenditure of heat being, therefore, 180 and 90 Cal. respectively. This difference could not be attributed to differences either in the chemical work of the plant, to external conditions, or to difference in leaf surface of evaporation. It could only come from calorific energy due to the transformation of luminous radiations by the chlorophyl. A diminution of the activity of a plant must consequently produce a decoloration of its green organs, and this was found to occur in the case of plants 3 and 4, the chlorosis being the means by which the plant protects itself against an exaggerated rise in temperature.

In the case of the control plant on the day mentioned, when the expenditure of heat due to the evaporation of the water was 180 Cal., the increase in dry weight was 2 grams. For this gain in weight, about 8 Cal. were absorbed. The author considers that the difference comes from the chlorophyl, and that it is rash to attribute to this substance any immediate action on the chemical changes taking place during the assimilation of carbon. The rôle of the pigments of the higher plants is purely physical. (*Journal of the Chemical Society*, Vols. 107 and 108, July 1915.)

Village Clubs and Associations in England.—It is not too much to say that during the last century such corporate life as the villages of England have enjoyed has centred round their various clubs, and it is noteworthy that the birth and development of these institutions have been due to the associative instinct of the labourers, the artisans, and the small middlemen. For a large part of the nineteenth century the farmers were too prosperous to feel the need of collective action, and the economic benefits offered by the usual village associations were not of the kind to attract them, so that they only appeared in connexion with those societies as honorary members or friends. Harder times have once more reminded them of the economy of mutual action for protection and advancement, and such organizations as the National Farmers' Union, with its county and village branches, and the various farmers' co-operative societies, are the outcome of it. But for a century or more it was the humble inhabitants of the villages who carried on the traditions of associated life in rural England. (*Journal of the Royal Agricultural Society of England*, Vol. 75, 1614.)

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The new movement in the direction of organizing science in Great Britain is dealt with in the editorial to this number. The significance in relation to the organization of science in agriculture also receives attention.

Considerable space is devoted in this issue to subjects pertaining to the production of sugar. These articles will be found on pages 292 to 293.

On page 291 will be found a summary of the contents of the recently issued report on the St. Lucia Agricultural Department, 1914-15.

Insect Notes, on page 298, give an illustrated account of West Indian wasps, while Fungus Notes, page 302, refer to a disease of mangoes and give an interesting summary of the new pamphlet just issued on the diseases of lime trees in forest districts.

A New Pamphlet.

On another page in this number will be found a note summarising the contents of Pamphlet No. 79 just issued by this Department on the subject of diseases of lime trees in forest districts. The pamphlet is written by Mr. W. Nowell, Mycologist to this Department, who has given the subject much attention both in the field and the laboratory, and the causes and methods of control are very clearly indicated. Primarily the information refers to the inland plantations of Dominica where for some time a proportion of the lime trees have been severely affected by root diseases. There is no doubt that the trouble can be arrested by the general adoption of the methods indicated, but there is no known specific in the nature of a definite cure. Everything depends upon the planter's approaching the problem in an intelligent and systematic manner. To assist in this Mr. Nowell gives a plain-worded account of the nature of fungi and the ways in which they work. Popular ideas on these points are less enlightened than they should be, considering how much has been done in past years to stimulate a proper appreciation. From a literary standpoint the chief feature of the pamphlet is its plain-worded and convincing style. The planter's point of view is kept in mind throughout.

The price of the publication is 3*d*. There are forty odd pages of subject-matter and five plates, prepared from original photographs.

Is the Fermentation of Cacao Necessary ?

It was urged by Professor Perret at the Third International Congress of Tropical Agriculture that cacao might be prepared for export on the estate by 'stablization' in steam under pressure. This produces a product which is incapable of undergoing any chemical change, and there is good reason for believing that beans thus stertilized could be used in the chocolate industry.

A quality of cacao so treated on the Ivory Coast has been submitted through one of the largest French chocolate firms to industrial treatment. To the astonishment of those who were entrusted with the roasting, the cacao became fragrant and was in no respect inferior to the products obtained by fermentation in the same region. Here, therefore, is evidence showing that fermentation of cacao seems to be of no advantage for obtaining an excellent product for manufacturing purposes, and it is believed that its adoption would have the double advantage of not raising the net cost of production as well as securing for the manufacturers uniformity of grade.

It may be asked whether this method of treating cacao is not worth consideration as regards the West Indies, particularly on those estates where trouble is experienced in this matter. It might prove useful for growers to communicate through their merchants or direct with chocolate manufacturers in regard to this interesting point.

Trade Conditions in British Colonies since the War.

In Round the Empire Notes appearing in the August number of the *United Empire*, attention is called to the disorganization of trade in some of the larger British Colonies, consequent on the war. In West Africa, for instance, it is mentioned that the entire business system of Nigeria has become more or less disorganized since the outbreak of war. Certain new outlets for trade have been opened up lately, however, and it is hoped that the benefit derived from these will, to some extent, counterbalance the losses experienced by the closing of other outlets. Importers of tropical products and raw materials have suffered considerably, and are likely to continue to do so on account of irregular markets, difficulties in delivery, and heavy additional costs occasioned by the increase in freights and insurances, and in the prices of coal and material. With regard to mining, the state of war on the Cameroon frontier has occasioned a temporary setback to this industry in Nigeria. In spite of the present stagnation however, the assumption is made that with the situation settled in West Africa, trading there is likely to expand beyond the limits hitherto obtainable.

Similarly, in India, the first result of the war was the abrupt cessation of the considerable trade with Germany and Austria-Hungary, the imports of private merchandise from which countries, during 1913-14, represented 7 per cent. and 2·3 per cent., respectively, of the total imports of India: while of the exports from India, Germany took 10·6 per cent. and Austria-Hungary 4 per cent., the chief items being food-grains, raw cotton, jute, seeds, hides, and skins. The shutting off of the export trade is said to have proved even more serious than the closure of the import trade, both by reason of its greater value and because the removal of these two customers for exported Indian goods concurrently with the dislocation of trade in other directions, resulted in a reduction in the demand for, and in the price of, certain important commodities. In regard to jute for example, Bengal has been greatly affected. Very high prices were realized in the preceding year, as much as £6 being obtained for a bale of raw jute. A record crop was grown last year, and prices fell as low as £2 1*s.* 4*d.* a bale. Difficulties have also been experienced with regard to cotton, mainly on the Bombay side. The position was unsatisfactory when war broke out, previous overtrading, and the depression caused by the banking crisis of 1913-14 having led to the accumulation of stocks of piece-goods and the lock up of capital in connexion therewith. Then came the war, and with it the cutting off of markets and a fall in the price of raw cotton. Another staple product seriously affected is the ground nut crop of Madras, which is usually largely exported to France. It is satisfactory to mention, however, that the general situation has been eased to some extent by the recovered security of Indian waters, and there are also welcome indications of increasing confidence and trade activity in India itself.

Guide to the Dominica Gardens.

The following appreciative review of the Official Guide to the Botanic Gardens, Dominica, which was issued by this Department, is taken from *Nature*, for July 29, 1915:—

'An official guide to the Botanic Gardens, Dominica, has recently been issued (price 6*d.*), to which we would direct the particular attention of all interested in botany and in the tropical economic products of the world. The guide consists of some forty-four pages, with a good index, a map of the gardens, and a number of interesting illustrations. The area under cultivation is now about 60 acres, and consists of the garden proper of 44 acres, with experiment grounds and nurseries. In the latter are raised the lime, cacao, mango, Para rubber, coffee, and other plants which are supplied at cost price to the planting community, and it is here that the grafting of cacao, limes, etc., and other experiments are carried out, which have made the Dominica Gardens renowned. To the botanist, however, the garden proper is the more important feature. Here may be seen a multitude of interesting and useful trees and shrubs remarkably well grown and displayed, and in the guide particulars of the various plants and notes on their economic value are given. In 1892, a year after the garden was formed, Mr. Joseph Jones was sent from Kew and has now been Curator for twenty-three years. It is to his skill and devotion that Dominica now possesses for its size one of the finest tropical botanic gardens in the world. Mr. Jones is to be congratulated on having produced so excellent and useful a guide, which will be much appreciated.'

The Control of Ticks.

Our readers will have noted the advertising campaign which Messrs. Cooper and Nephews have started in the West Indies through the medium of this journal. By this and other efforts the firm has shown considerable enterprise in the West Indies, and not without justification. The veterinary problem of the West Indies is the tick problem. It is true that cattle raising and dairying are not organized industries as they are in other and larger parts of the Empire: this to some extent excuses the general apathy of local stock owners: but the fact remains that with working cattle the efficiency of the animals is greatly increased by the eradication of ticks, and there is no doubt that the same holds good for animals raised locally for the purpose of supplying meat and milk. The results obtained from spraying in Antigua have justified the most sanguine expectations. Animals that have been treated two or three times show a complete absence of the parasite, and they look more thrifty and their skins are softer and more pliable. For a full account of the results of the trials referred to, the reader may consult the *West Indian Bulletin*, Vol. XIV, No. 2, pp. 122-25. A more recent article on the subject is that which appears in the *Agricultural News* for July 3, 1915, where it is stated that Messrs. Cooper and Nephews have offered bonuses equal to half the cost of erecting two swim dips in Antigua.

INSECT NOTES.

WEST INDIAN WASPS.

Certain species of wasps are known in the West Indies as Jack Spaniards, and the names wild bee, cow bee, and maribunta are also applied to these insects.

The most common and generally distributed in the Leeward and Windward Islands of these wasps is the one to which the name Jack Spaniard is most usually applied. This is *Polistes crinitus*. It appears to occur throughout the Windward and Leeward Islands, being abundant in most of those islands, but is rare in Barbados. It builds a nest which is attached by a stem at one end, the nest being rather long and narrow.

FIG. 13. Nest of *Polistes annularis*.

The wild bee in Barbados is *Polistes annularis*. It occurs also in St. Vincent and has been introduced into Montserrat. It is a larger insect than *P. crinitus*, building a similar nest, attached by a stem at one side. *P. annularis* is distinguished by the bright-yellow crescent-shaped patch on the base of the abdomen.

The cow bee *P. bellicosus* occurs in Barbados in the West Indies, but it is also recorded in the Southern United States. It is a darker insect than the wild bee and differs from that insect in the manner of building its nest, which is attached by a stem situated near the middle, instead of at one side.

In Grenada, the maribunta (*Polybia occidentalis*) is the common wasp. It is a much smaller insect than the three species of Polistes just mentioned.

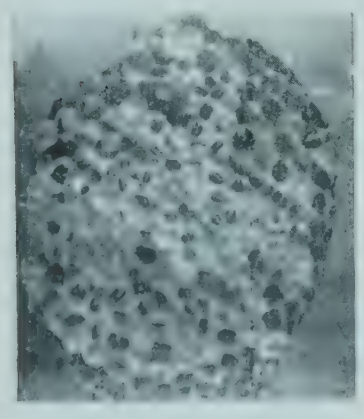

FIG. 14. Nest of *Polistes annularis* showing the disease.

In the Virgin Islands a wasp very much like the maribunta in size and general appearance is *Megacanthops indeterminabis*.

The Jack Spaniard (*Polistes crinitus*) is the insect which has been mentioned in publications of this Department as *P. fuscatus-instabilis*.

Probably all these wasps are predaceous in their habit of feeding. Certainly some of them are, for the three species of Polistes are well-known enemies of many other insects. In St. Vincent, the effect of the feeding of *Polistes annularis* on the cotton worm was of so much value that for some ten years cotton was grown in that island without resort to the use of Paris green or other poison for the control of this pest which, during these same years, caused so much loss and expense in other islands. *Polistes bellicosus* in Barbados, and *P. crinitus* in other islands, are also active predators on caterpillars and other insects. In St. Vincent the value of *P. annularis* as an enemy of the cotton worm is so much appreciated that planters build sheds in and near cotton fields in order to encourage these wasps to make their nests there, and to give them ample nesting opportunities where they may be free from disturbance.

FIG. 15. *Polistes bellicosus*.

The Barbados wild bee, or St. Vincent Jack Spaniard, has been introduced into Montserrat in the hope of establishing it in that island where it might help to control the cotton worm. So far, this introduction has only partly succeeded, and it has been discovered that this is due to the action of a so-called disease which destroys the young brood in the nest. (Fig. 14.)

This disease proves to be due to the attack of a small moth, the larva of which penetrates through and through the nest, apparently destroying the larvae and pupae of the wasp.

When the moth larvae become full-grown they pupate in the cells of the wasp's nest, each cell containing a cocoon, which terminates outwardly in a ridged cover or cap which can be distinctly seen in the cell of the nest.

The moth which causes this diseased condition has been identified by the Imperial Bureau of Entomology as

FIG. 16. Shed for Jack Spaniards.

Dicymolomia pegasalis, Walk. A hymenopterous insect, probably parasitic in its habits, has also been bred from these diseased nests, but whether it attacks the wasp or the moth has not yet been determined.

This parasitic or predaceous moth is probably not confined to Montserrat, a similar diseased condition of nests of *P. crinitus* having been observed in St. Kitts, and it seems likely that the abundance and consequent usefulness of Jack Spaniards as enemies of insect pests are materially affected by the action of this small moth.

H. A. B.

The Frog as a Pest of Corn.—The question as to whether the frog will attack young corn is discussed in the following note appearing in the *Journal of the Jamaica Agricultural Society*. It appears that in Jamaica this animal as well as the dog may become at times a serious pest:—

'Very frequently it has been stated by small growers of corn that frogs destroy the young corn by eating it. The closest observation—going out into the fields at night and in the early morning—never showed any damage to any corn we ever had that could be put down to frogs, except that where they were in large numbers, the frogs found the corn holes, especially after rains, nice cool places to burrow in, when of course, they disturbed the corn that had just started growing or was a little above the ground; and we have often stated our conclusions in reply to statements that frogs ate young corn. We have hever seen it stated, too, from any part of the world that frogs ate any vegetable material whatever—they consume insects. However, it is well not to be too dogmatic in agriculture. Mr. Schleifer, the Agricultural Instructor, has corn planted in Clarendon by the banks of a river, and he has stated from his own personal observation that at night he has found frogs eating the corn, and on opening some he has found the young corn shoots in their stomachs. We reported this to the Entomologist, and it is also new to him that frogs ate vegetable matter in this way. Further investigation, however, will be made. Certainly if a carnivorous animal like the mongoose can become a fruit eater and eat pine-apples and bananas, and when dogs, ill fed at home, make raids into cornfields when the cobs are ripening, jump up, tear down the cobs and eat them, we are prepared for any changes. Dogs, too, scrape out the seed corn just planted and eat the grain.'

EXPERIMENTAL WORK IN ST. CROIX.

The chief event that occurred during 1914 in connexion with the St. Croix Experiment Station was the addition of the estate known as Anna's Hope, the area of which, including the parts already owned by the Experiment Station, is 215 acres. Of this amount 170 acres are arable. The experimental work conducted thereon and on private estates is described by Dr. Longfield Smith (the Director) in his Report for 1913-14.

When taken over, the estate was in a very run-down condition. With the help of the motor plough, the Director succeeded in preparing and planting 45 acres in cotton from August to October, and this cotton, considering its late planting, has yielded well. Only seeds obtained from the plots of the best selected plants of the previous year were planted, and in this way a large amount of special cotton seed was obtained for the use of planters. This supply has been largely made use of, 5,000 lb. of this seed having been sold for planting purposes in 1914.

Early in 1914 about 15 acres of the estate land was planted in new varieties of cane, while 4 acres of the most stony land was planted in sisal. Experiments with corn, imphee and other crops were also carried out.

The manurial experiments with sugar-canes conducted at the station have led to the general conclusion that the use of artificial manures in cane cultivation is not advisable. It is probable that in St. Croix the limiting factor in cane production is the rainfall, and when the usual application of about 20 tons of pen manure per acre is applied in the preparation of cane land for plant canes, the soil contains all the food which is necessary for the growth of the small crop that the limited rainfall can produce.

Experiments of some interest have been carried out in regard to bud selection, and the distance of planting canes. There is some indication that bud selection may be a means of carrying on observed vigour in any particular plant in the field. The experiments on distance of planting show clearly that the best results are obtained by close planting. This result is in accordance with those obtained recently in Porto Rico.

The report from which the foregoing information has been taken devotes a considerable amount of space to results obtained with different varieties of sugar-cane including those raised locally. Several varieties have been produced which show great promise, but it is emphasized that with new varieties of cane raised from seed several years are necessary to show their real merits. Of the imported canes, B.16536 is stated to have done the best. Cane D.6360 gave the best results, as a plant cane, for the first two years' trials, but has dropped to sixth place this year.

The information contained in the report concerning experiments conducted with cotton are of interest, but need not be dealt with here, in view of the fact that this information has already been reviewed in the *Agricultural News*, on page 134 of the present volume.

Cacao in the Southern Provinces, Nigeria.—A great deal of new land has been planted with cacao within the last three or four years, and for which the Department of Agriculture has supplied about 90,000 plants and 164,000 seeds. This Department is also establishing small model plots of cacao in the various districts suitable for cacao cultivation. The object of these plots is to teach the planters how to plant and care for their trees, and when they come into bearing, demonstrations as to the preparation of the crop will be given. In conjunction with these plots nurseries are being formed to raise plants for distribution. European agricultural officers and native agricultural instructors visit the principal cacao-growing districts to give instructions in the cultivation and preparation of cacao.

When the newly planted areas come into bearing, and as planters become better acquainted with the proper way to plant and take care of their trees, it is anticipated that a very considerable increase in the exports of cacao will be manifested.

In 1905 the exports of cacao from Nigeria were worth £16,922. In 1913 the value had risen to £157,480. (*Proceedings of the Third International Congress of Tropical Agriculture.*)

In a note in the *Experiment Station Record* (Vol. XXXIII, No. 1) it is shown that the rainfall of the United States cotton belt varies widely, the average annual rainfall being 31 inches in the west and 54 inches in the south-east. There is apparently a direct relation between rainfall and temperature, an average low temperature meaning, as a rule, a small amount of precipitation. Correlating rainfall with crop growth, the conclusion is reached that the best conditions for growing cotton occur about latitude 32° N. in an area where the total annual rainfall is about 50 inches per annum, where the temperature is normal and therefore almost entirely a fuction of the latitude, and where the crop rainfall depends upon the rising temperature and upon the slacking effect of oceanic influences, so that an average rainfall of 20 inches can readily be obtained during the five or six months required for the growth of the cotton plant.

The relation of rainfall to other crops grown in the cotton belt is also briefly considered.

GLEANINGS.

It is stated in the *Dominica Chronicle* for August 11, 1915, that by a special proclamation issued in the *Official Gazette*, the Administrator has prohibited absolutely the importation into Dominica from the United States of any citrus plants or budwood.

According to the Medical Report on the Presidency of St. Kitts-Nevis, the estimated number of inhabitants in 1914 was as follows: St. Kitts, 26,658; Nevis, 13,528; Anguilla, 4,494. The respective increases over and above the estimate for the previous year are 175, 193, and 133.

It is stated in *The Board of Trade Journal* for August 5, 1915, that the total value of the exports from the French Colony of Réunion in 1914 was £691,250 as against £663,667 in 1913. The principal exports are vanilla, rum, tapioca, perfume essences, also fibre and vacoa.

The annual report of the Registrar of civil status, St. Lucia, for the year 1914-15, states that on March 31, 1914, the population of the colony was considered to have been 50,809, while on March 31, 1915, it was computed to have risen to 51,590, a natural increase of 781.

The principal agricultural exports from Colombia in 1912 were coffee, bananas, rubber, and raw tobacco. The value of the coffee exported was 16,777,908 gold dollars, while that of bananas was 1,996,999 gold dollars. The value of the cattle hides exported was 2,661,722 gold dollars. (*Diplomatic and Consular Reports*, No. 5437, Annual Series.)

It is gleaned from the *Proceedings of the Agricultural Society of Trinidad and Tobago*, for June 1915, that the Permanent Exhibition Committee of that colony has voted £100 for the improvement of the Trinidad Court in the Colonial Galleries at the Imperial Institute. Those who have visited the Trinidad exhibition will realize that this contribution has for some time been badly needed.

An interesting catalogue entitled Grafted Tropical Fruit Trees has been received from the French Seed and Nursery Company, 13 Clive Row, Calcutta, India. A large number of grafted mangoes, litchi grafts, lime and lemon and orange grafts, as well as many novelties are listed together with prices. The publication should prove interesting to officers in charge of Botanic Gardens in the West Indies.

A statement appears in the *Voice of St. Lucia* for August 14, to the effect that Union estate where lately the agricultural school was situated, will be utilized as soon as funds are available for the purposes of an industrial school. It appears that there is some necessity for such an institution in St. Lucia, but if it is established provision should be made for the teaching of agricultural as well as industrial subjects.

A valuable monograph on the distribution in tropical North America of species of Panicum has been received from the Smithsonian Institution at Washington. The senior author is Mr. A. S. Hitchcock, who is rendering valuable assistance at the present time in regard to the identification of grasses collected in the West Indies. The publication under review gives the distribution of the species in the different West Indian islands.

The following articles published by this Department are listed in recent issues of *The Board of Trade Journal* as likely to be useful for reference commercially: Agricultural Industries of Montserrat (*West Indian Bulletin*), Sugar-cane Cultivation in the Leeward Islands (*Agricultural News*), Citrus Cultivation in the Philippines (*Agricultural News*), and Fishing Industry in the British West Indies (Editorial, *Agricultural News*).

In discussing the improvement of native cattle in Jamaica, the Director of Agriculture states that the pure bred Mysores, are the hardiest, staunchest and most reliable draft animals yet tested in the island. Fresh blood from the herds in Mysore is now desirable in order to maintain the highest standard of breed in Jamaica, although experts from India have recorded their opinion that there are finer specimens of the Mysore to be seen in Jamaica than in India itself.

The control of weeds, according to *Farmers' Bulletin No. 660* (United States Department of Agriculture), depends largely upon the observance of three main principles: (1) preventing weeds from growing to seed on the estate, (2) preventing the introduction of weed seeds, (3) preventing perennial weeds from making top growth. The entrance of weed seed, particularly that carried by wind, can be prevented very often by the establishment of protecting hedges.

According to a communication from a Javan Experiment Station, translated and published in the *Louisiana Planter*, the movement described as taking place in the stomata of grasses is impossible in the case of sugar-cane leaf-pores. The cells can vary their distance in a very small degree by changing their position between the surrounding epidermis cells, but the position and structure of the accessory cells make it possible to change the length of the slit in the vertical direction.

In continuation of previous cultural experiments with onions, the *Experiment Station Record* (Vol. XXXIII, No. 1) gives the results of fertilizer tests conducted with Bermuda and Denia onions for three seasons. Concise directions are also given for growing onions by the transplanting method, which has been found to be the best and most economical. The fertilizer tests with onions have shown in general the value of fertilizers, and especially of nitrate of soda, in increasing the yields.

THE MAHUA OR ILLUPEI TREE OF INDIA.

The mahua, malwa, mowha, mowa, or mowra tree of India is a large deciduous tree throughout the forests of Dekkan, Carnatic, West Coast and Central India, and Guzerat, stretching north as far as Oudh and Kumaun, and eastward across to Orissa, according to the American Consul-General at Calcutta. Though found in a purely wild state in many parts of India, the value of the flowers and fruit has caused it to be brought under more or less cultivation. The economic value of the tree lies in its edible flowers and oil-yielding seeds, although the gum or gutta that flows from incisions or abrasions on the stems shows an average of 48·9 per cent. gutta, 38·8 per cent. resin, and 12·3 per cent. ash. The bark also is used as a dye, while many of the properties of the tree are used to some extent medicinally. The mahua puts forth its leaves from February to April. Cream-coloured flowers appear in great clusters of thirty to fifty near the ends of the branches from March to April. About the end of March the flowers begin to arrive at maturity, and every morning about sunrise the succulent corolla tubes fall in great showers to the ground, which has been cleared of grass and underbrush and prepared for the harvest. This continues to the end of April, but usually the fall from a single tree is complete in seven to ten days. The flowers are then spread out and left to dry in the sun; in a few days they shrink in size, change in colour to a reddish brown, and their peculiar sweet odour becomes more apparent. These flowers are eaten extensively while fresh, but generally speaking they are dried thoroughly and cooked with rice and other grains. Sometimes they are completely dried and reduced to a powder, and in this condition are cooked in round cakes and mixed with a variety of foodstuffs. Mahua is extremely sweet, and the ability to eat and digest it must be acquired. Few Europeans are able to eat more than one flower on a single occasion without having disagreeable after effects. Sugar and molasses of a good quality are also made of mahua.

The art of distilling these flowers is a very ancient one. For the manufacture of spirits the flowers, when dried, are sold to village distillers or Government distilleries. The flowers are immersed in water for about four days; they are then fermented and thereafter distilled. The spirit produced has at first a strong, smoky flavour, but age remedies this. The seeds of the mahua, which succeed the flower from which the spirit is made, are extensively used for the manufacture of mahua butter, which is employed in the adulteration of ghee, for lubricating and illuminating purposes, and for eating by the native people. The method of expression is crude. The kernels are taken from the smooth, chestnut-coloured pericarp by being bruised, rubbed, and subjected to a moderate pressure. In the Central Provinces the kernels are pounded, boiled, wrapped in several folds of cloth, and the oil thereafter expressed. (*Journal of the Royal Society of Arts*, July 16, 1915.)

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on August 31 by the S.S. 'Guiana' for the purpose of making an official visit to St. Lucia. The Commissioner returned to Barbados by the C.R.M.S. Caraquet' on September 8.

MOTOR PLOUGHING IN THE WEST INDIES.

The following note is taken from a recently published report on the Agricultural Experiment Station, St. Croix (D. W. I.):—

The Twin City 40 h.p. gasoline tractor, and the John Deere six bottom engine gang plough with subsoil attachments, mentioned in the last report as having been ordered for the Department of Agriculture, arrived in August, and since then has been kept in fairly continuous work. The machine is hired to planters, who pay for the work done according to the amount of gasoline and oil used on the job. The wages of the men employed on the machine have also to be paid by the planter for the days when they are working on his estate, also any shares broken have to be paid for, and a small charge, viz. 5 per cent. of the total cost of the ploughing, is made for repairs and to allow for expenses during the time when the plough is lying idle. The money received for ploughing in this way has nearly covered the expenses. The total number of acres ploughed to the end of June was about 420, and the total cost of this has been about $1,900. In most cases the land was subsoiled as well as ploughed for this sum, and where subsoiling was not done, the plough generally carried a harrow. It must be remembered that periods occurred when the plough was idle for some weeks. During such idle time the wages of the driver in charge have continued. All this has been included in the cost given above. There has been no breakdown of the tractor, but several repairs have had to be made to the ploughs themselves. The latter are rather too light for some of the work we have to do, and in strong ground shares break rather frequently. It is too early yet to say what effect the deeper ploughing over that ordinarily practised has had on the cane crop. The machine has been made use of for cotton planting as well as for cane, and in this case the subsoilers have not been used. The ploughing of cotton land to a depth of 7 or 8 inches in fields which are not too short, can be done for $2·50 to $3·00 per acre.

The *Experiment Station Record* (Vol. XXXIII, No. 1) refers to a recent article by Professor Mc.Fadyean which is stated to consist of a discussion of the measures which ought to be put in force against tuberculosis, prefaced by a short examination of the evidence for and against the view that the disease is transmissible to man. The subject is dealt with under the headings of transmissibility of bovine tuberculosis to man; types of tubercle bacilli; the eradication of bovine tuberculosis; measures necessary to safeguard human health; and measures to be taken against breeding cattle which have reacted to tuberculin, from the point of view of international trade.

'There is one, and only one, method by which tuberculosis can be eradicated from a herd, namely, that which relies upon the systematic use of tuberculin for diagnosis, and which requires the permanent separation of non-reacting animals from those which have not been tested or which have reacted.'

FUNGUS NOTES.

DISEASES OF LIME TREES IN FOREST DISTRICTS.

Number 79 of the Pamphlet Series of the Imperial Department of Agriculture, issued under the above title, gives an account of the troubles due to fungous diseases experienced in districts where limes are planted in areas recently cleared from forest. An attempt has been made to present the results of the study of these diseases in non-technical language.

So far the affections discussed are known on lime trees only in certain districts in Dominica, but since the causative fungi of all but one of the diseases are known to occur in other islands of the Antilles and quite probably all are generally distributed, there is every reason to expect similar developments when suitable opportunities are provided in St. Lucia and Grenada.

The so-called Black Root Disease of limes is now shown to be separable into two distinct forms, the one caused by the familiar root disease fungus of cacao, *Rosellinia Pepo*, Pat., the specific identity of which has been at last revealed by the finding of fertile perithecia, the other by *Rosellinia bunodes* (B. et Br.), Sacc. The latter species has not been recognized on cacao, but occurs commonly in the affected districts on Hibiscus and Acalypha, has been recorded from Grenada on Castilloa and camphor, and is described in a recent bulletin as the cause of extensive damage in coffee plantations in Porto Rico. No doubt it had a part in the 'blight' associated with the decline of coffee cultivation in Dominica in the seventies of last century.

While the damage done by Black Root Disease in lime cultivation has been sufficiently severe, it is rather the prospect of its continued extension that has given rise to apprehensions. Reasons are given in the pamphlet under discussion for the belief that by the adoption of fairly simple measures the disease can be kept in control, and confined to sporadic cases of somewhat rare occurrence. Were this result achieved the effects of the disease would be practically negligible, since it is its propensity for opening up gaps covering the sites of some dozens of trees in a patch which has constituted the chief menace.

The pamphlet should be found useful by cacao planters, as a large part of the information respecting Rosellinia disease applies equally to its occurrence in cacao cultivations, and the measures of control are much the same in the two cases.

The question of treatment is dealt with in considerable detail. Discussion is confined to means of prevention, attempts at cure being regarded as unprofitable under the prevailing circumstances of extensive cultivation and restricted labour supply. Diagrams are given of systems of isolation trenches.

An allusion is made to the apparent immunity of sour orange stock, and it is stated that trials are now being made on as large a scale as possible to test the resistance and suitability of budded trees.

The Red Root Disease of limes is next dealt with. Though regarded primarily as a disease of forest districts this affection occurs to some extent on old established valley estates. When it is present it is found to be quite as capable as the black root disease of killing out large groups of trees. It spreads in the same way from root to root, and has to be met with exactly the same measures as that disease.

The Pink Disease of the twigs, which concludes the list, has not so far done any serious damage to lime trees. It kills out small branches here and there in very moist and sheltered situations. It is known on cacao and other plants but has never assumed in the West Indies the importance of the parallel or identical pink disease of plantation rubber trees in the Malay States.

The pamphlet is illustrated with five plates showing the distinctive features of the root diseases described.

A BACTERIAL MANGO DISEASE.

In the *Annals of Applied Biology* II, pp. 1-44 appears an account of a detailed research on a disease of mangoes in South Africa by Ethel M. Doidge, M.A., F.L.S., Mycologist, Division of Botany, Pretoria.

The virulence of the disease is such as to threaten seriously to affect the export trade in mangoes. A large percentage of the fruit falls to the ground whilst yet immature, and the mangoes which remain on the trees are rendered unsightly and unfit for the market. The disease was first reported from Barberton in the Transvaal in 1909 and is said to have appeared there after a hailstorm in 1906, the infection starting in a corner of an orchard and spreading rapidly with the prevailing winds. In 1908 not a single fruit was obtained from sixty trees. Each season since the disease has been steadily gaining ground. No record has been found by the author of any similar affection in other parts of the world.

The damage done is mainly to the fruit. Infection also occurs on leaves and branches, producing lesions in which the bacterium is carried over from one crop to the next. On the leaves small angular water-soaked areas, some 2-3 mm. in diameter, appear, which later become dark brown; the surface is somewhat raised and shining and frequently there is a slight exudation of gum. Longitudinal cracks are produced in infected petioles On twigs and branches discoloured spots occur which are followed by gumming and the development of deep cracks. By the time the fruit is half-grown the whole inflorescence has frequently become affected, and the death of the stalks causes the fruit to drop. On the fruit itself the first sign of the disease is a small water-soaked area; this spreads considerably, and an irregular discoloured spot, intersected with cracks, is eventually produced. The discoloration extends for some distance into the flesh.

All the commonly grown varieties are affected, but in differing degrees. The disease has not been found on related indigenous trees.

Extensive spraying experiments with various mixtures have so far given no evidence of the possibility of control by this means, nor have any other remedial measures proved effectual.

The cause of the disease has been shown to be a rod-shaped bacterium to which the name *Bacillus mangiferae* has been given. It is found in great abundance in the parenchymatous tissues of the discoloured areas. It does not affect lignified tissues. The optimum temperature for growth of the organism under laboratory conditions is about 30 C. (86 F.) It grows very slowly at 45 C. (113 F.).

Infection appears to be principally carried from tree to tree by wind, and is distributed about the tree in rain-water dripping from infested leaves.

W.N.

Diseases of Para Rubber trees in Ceylon.—We have received, says *Nature* (August 5, 1915), a copy of a paper on the fungus diseases of *Hevea brasiliensis* contributed by Mr. T. Petch, Government Mycologist, Ceylon, to the International Rubber Congress held at Batavia last year. It is reassuring to read that notwithstanding the vast areas under Hevea cultivation, often under bad conditions, no very serious parasitic fungus has as yet been noticed. *Fomes semitostus*, the root disease, first recorded by Ridley at Singapore in 1904, which was much feared, is proving to be of minor importance as the plantations increase in age, and as the jungle stumps on which it flourishes disappear. The stem diseases, of which six have been recorded, are perhaps the most dangerous. Three of these, pink disease (*Corticium salmonicolor*) die-back (caused especially by *Botryodiplodia theobromae*) a well-known cacao disease, and canker due to *Phytophthora faberi* are especially to be feared. It is suggested that Bordeaux mixture may prove effective as a preventive to canker.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of July:—

In the early part of July business in Mincing Lane was somewhat hampered by the usual half-yearly stock-taking which is always followed closely by the annual summer holidays, which at the time of writing are being taken, though in a somewhat more subdued fashion than in ordinary peace times. Nothwithstanding all these drawbacks, however, a fair amount of business has been transacted during the month both in spices and drugs, with prices ruling in favour of the seller rather than the buyer, as will be seen from the following details.

GINGER.

At auction on the 14th of the month as many as 415 packages of Jamaica were offered, and all bought in at 62*s.* to 63*s.* for low middling. At the same auction, Cochin and Calicut were represented by 960 packages, which were also bought in at the following rates: good small cut Calicut 42*s.*, washed rough Cochin 29*s.*, and brown rough Calicut 30*s.* At the concluding sale of the month, namely on the 27th, 874 packages of Cochin and Calicut were offered and all bought in, brown rough Calicut at 30*s.*, fair bright at 35*s.*, and washed rough Cochin at 30*s.*

NUTMEGS, MACE AND PIMENTO.

At auction on the 14th, 58 barrels of West Indian nutmegs and 60 of limed Java were offered and sold at previous rates. At the last auction on the 27th, nutmegs were in very quiet demand at prices ranging from 4½*d.* to 6½*d.* for West Indian. At the auction on the 14th, mace was in steady demand, 14 cases of Java, fair bold curly, fetching 2*s.* 3*d.* per lb., partially broken 2*s.*, and ordinary red 1*s.* 9*d.* At the same auction pimento was represented by 674 bags, of which 200 sold at 1⅞*d.* for fair quality.

SARSAPARILLA.

At the drug auction on the 8th of the month sarsaparilla was in good supply, being represented by 39 bales of grey Jamaica, of which 14 only found buyers at 2*s.* per lb. for fair quality; 20 bales of native Jamaica were also offered, and 16 sold at 1*s.* 2*d.* to 1*s.* 3*d.* for dull red mixed to fair red; 52 bales of Honduras were also offered and 10 of Mexican, none of which found buyers.

LIME JUICE, LIME OIL, CITRIC ACID, ANNATTO, TAMARINDS, AND KOLA.

At the beginning of the month it was stated that a limited quantity of new crop lime juice was obtainable in the market at 3*s.* 9*d.* per gallon; at auction on the 21st it was stated that a limited quantity of West Indian expressed oil of limes was to be obtained at 7*s.* per lb. In the previous week the quotation was 7*s.* 6*d.*, while the distilled oil was quoted at 6*s.* Citric acid throughout the month has remained steady at from 3*s.* 5½*d.* to 3*s.* 6*d.* per lb. A consignment of 94 packages of annatto seed was offered at the beginning of the month but found no buyers. It was said that fair bright East Indian were obtainable at 8*d.*, and dull at 7½*d.* At the last auction on the 27th, good new crop Barbados tamarinds were quoted at 17*s.* 9*d.* per cwt. At the first auction on the 8th, 9 packages of dull Ceylon kola, in halves, fetched 5*d.* per lb., while 2 bags of fair Jamaica realized 1*s.* 9*d.*

American versus Local Corn.—The following contains the results of an experiment conducted with Indian corn by the acting Curator of the Experiment Station, Tortola.

Two plots ⅐-acre in area were laid out. One planted with an American strain of corn acclimatized to West Indian conditions and grown in Anguilla, and the other with a local variety.

Previous to planting the field received a dressing of pen manure at the rate of 13 tons per acre, approximately.

Both strains germinated well and were soon developed into vigorous and healthy trees. The imported corn eventually developed the higher trees, some attaining a height of 9 feet.

Striking differences in the characteristics of the matured ears were to be noticed. The imported corn developed ears only 8 inches long, and containing seventeen rows of kernels, while the local corn produced ears 10 inches long with only fourteen rows of kernels.

The returns of the plots are as follows:—

Variety.	Size of plot.	Actual yield.	Seed corn per cent.	Calculated yield per acre.
Imported American	⅐-acre	273 lb. seed	80	1,911 lb. or 34 bushels
Local Strain	⅐-acre	274 „ „	78	1,913 lb. or 34¼ bushels

The returns are very good and indicate that the local breed of corn can, with proper cultivation, give handsome returns.

A supply of this seed corn is now kept at the Station for distribution.

It may be added that as a general rule American corn does not do very well in the West Indies: possibly the strain used in the above experiment might be useful for crossing purposes.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, August 10, 1915.

ARROWROOT—2¼*d.* to 4¾*d.*
BALATA—Sheet 2*s.* 4½*d.*; block 1*s.* 10*d.*
BEESWAX—No quotations.
CACAO—Trinidad, 80/- to 83/- per cwt.; Grenada, 75/- to 80/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—£23 10*s.* per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Jamaica, 55/- to 75/-.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 3/8 to 3.9; concentrated, £25; Otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations.
MACE—9*d.* to 2/11*d.*
NUTMEGS—4¼*d.* to 5¾*d.*
PIMENTO—No quotations.
RUBBER—Para, fine hard, 2/4¾; fine soft, 2/2¾; Castilloa, 2/2¼.
RUM—Jamaica, 2/5.

New York.—Messrs. GILLESPIE BROS. & Co., August 13, 1915.

CACAO—Caracas, 16½c. to 16¾c.; Grenada, 16¼c. to 17c.; Trinidad, 17c. to 17¼c.; Jamaica, 14½c. to 15c.
COCO-NUTS—Jamaica and Trinidad selects, $22·00 to $23·00; culls, $12·00 to $13·00.
COFFEE—Jamaica, 7¾c. to 11c. per lb.
GINGER—12½c. to 16c. per lb.
GOAT SKINS—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 38c. to 40c. per lb.
GRAPE FRUIT—Jamaica, $1·50 to $2·25.
LIMES.—$3·00 to $4·00.
MACE—47c. to 51c. per lb.
NUTMEGS—11c. to 11½c.
ORANGES—Jamaica, $1·50 to $2·00.
PIMENTO—3⅛c. per lb.
SUGAR—Centrifugals, 96°, 4·77c. to 4·83c.; Muscovados, 89°, 4·12c. to 4·18c.; Molasses, 89°, 3·99c. to 4·05c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., August 23, 1915.

CACAO—Venezuelan, $17·25 to $17·75; Trinidad, $17·00 to $17·50.
COCO-NUT OIL—78c. per Imperial gallon.
COFFEE—Venezuelan, 10c. to 12c. per lb.
COPRA—$3·80 to $4·00 per 100 lb.
DHAL—No quotations
ONIONS—$1·20 to $2·50 per 100 lb
PEAS, SPLIT—$11·50 per bag.
POTATOES—English $2·25 to $2·50 per 100 lb.
RICE—Yellow, $5·80 to $6·00; White, $5·00 to $5·75 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. T. S. GARRAWAY & Co., September 6, 1915; Messrs. JAMES A. LYNCH & Co., Ltd., September 6, 1915.

ARROWROOT—$4·00 to $4·60 per 100 lb.
CACAO—$14·50 per 100 lb.
COCO-NUTS—$16·00.
HAY—$1·70 to $1·90 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia, $85·00 to $90·00 per ton.
MOLASSES—No quotations.
ONIONS—$3·00 to $4·00 per 190 lb.
PEAS, SPLIT—Canada, $5·40 per 120 lb.
POTATOES—Nova Scotia, $3·00 to $3·25 per 160 lb.
RICE—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $6·00.

British Guiana.—Messrs. WIETING & RICHTER, August 21, 1915; Messrs. SANDBACH, PARKER & Co., August 20, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	—	$9·50
BALATA—Venezuela block	—	—
Demerara sheet	—	—
CACAO—Native	14c. to 15c. per lb.	16c. per lb.
CASSAVA—	$1·44	—
CASSAVA STARCH—	—	—
COCO-NUTS—	$10 to $15 per M.	$18 per M.
COFFEE—Creole	13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	10c. per lb.	10c. per lb.
DHAL—	$8·00	—
Green Dhal	—	—
EDDOES—	$1·92	—
MOLASSES—Yellow	None	—
ONIONS—Teneriffe	—	—
Madeira	—	—
PEAS—Split	$12·00 to $12·50	$13·00 to $14·00 per bag. (210 lb.)
Marseilles	—	5c. to 6c.
PLANTAINS—	20c. to 48c.	—
POTATOES—Nova Scotia	$2·75	$3·00
Lisbon	—	—
POTATOES—Sweet, B'bados	$2·16	—
RICE—Ballam	No quotation	—
Creole	$5·50 to $5·75	$5·50 to $5·75
TANNIAS—	$3·36	—
YAMS—White	—	—
Buck	$4·00	—
SUGAR—Dark crystals	$3·75 to $3·85	$3·75
Yellow	$4·25 to $4·35	$4·25
White	—	—
Molasses	$3·10	—
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	—

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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On Understanding a Crop and Its Requirements.

THE tropical planter, unlike his confrère farther north, is primarily interested in only one crop, and this crop is generally of the perennial sort. Thus we speak of the sugar-cane or rubber planter, or of the cacao or citrus grower, signifying in doing so that each in his line is more or less a specialist. Such being the case it behoves the planter to concentrate attention to the best of his ability on his crop's requirements, and to try to understand the inner working of the individual plant. The importance of doing so is rendered still more apparent when we remember that with most tropical crops the individual plant is of a relatively large size allowing only a comparatively small number to the acre.

In the first instance the study of the individual comes within the province of physiologist rather than of the planter, and it will prove instructive to enquire to what extent the physiologist has been at work. With some crops he has been much more active than with others. The outstanding work on the individual plant is that of Balls, whose work on Egyptian cotton is both exemplary and suggestive. This investigator has studied the cotton plant under a large number of different conditions, and has brought to light many new facts concerning its behaviour under a varying environment. Thus he has shown that the plant's activities are practically arrested during the hotter hours of the day, and that in Egypt, boll shedding is the result of root asphyxiation. Similar in some respects to Ball's work on the cotton plant is Copeland's investigation of the coco-nut. This latter scientist has demonstrated the detrimental effect of shade upon the plant, and has opened up quite a novel line of thought in regard to the measurement of the plant's rate of development by means of the leaf stalks. On the basis of this last mentioned observation it will be possible to express in arithmetical terms the development of a whole grove. A third crop which is being studied physiologically is Para rubber. In this connexion mention may be made of Campbell's recent work in Ceylon, which has shown that the effect of tapping on the rubber tree is quite local; consequently the distribution of tapping is equivalent to resting the tree—a conclusion of considerable importance. In regard to the crops mentioned, we have not referred to strictly mycological or entomological work, nor even to

manurial experiments, because these do not constitute the purely physiological investigation which we consider is so urgently necessary. As a matter of fact familiarity with the plant's habits and requirements under normal conditions is necessary before pathology and artificial nutrition can be rationally considered; and it has often been the case that supposed entomological or mycological troubles have been resolved ultimately to a purely physiological basis.

The cotton, coco-nut and rubber plant have been instanced as cases in which the individual is being carefully studied. There are many tropical economic plants which have been, and are, as carefully neglected. The sugar-cane is an example. It is a remarkable fact that whereas a whole army of investigators are engaged in the study of sugar manufacture, it is not possible to mention a single name associated with the systematic study of the cane plant's physiology. There can be no question but that there remains a great deal to be understood concerning this plant. The reasons for its remarkable synthesizing powers are quite unknown, nor has anyone attempted to show why it is that one variety can produce more sugar than another. The morphological development of the cane plant has not been worked out accurately, in spite of the fact that its growth is extremely symmetrical, thereby indicating the existence of very definite correlations. Similar remarks apply to cacao, limes and coffee. Great individuality is known to exist amongst cacao trees, and recently this has been taken into account in the conduct of manurial experiments. A group of trees selected by mere inspection to serve as a control plot may contain a preponderance of low yielding trees, whereas another group similarly selected by sight and at random for manurial treatment may include a preponderance of high yielders. The erroneous conclusions resulting from such an experiment can well be imagined. We are beginning to realize that in manurial experiments we must start with the individual of known habits just as we must start with the individual of known parentage in the case of genetics.

While referring to the case of the sugar-cane, mention was made of the large amount of attention that has been given to the manufacture of sugar in the factory, compared with that given to the plant in the field. This state of affairs is very general, and is to be seen both in the case of cacao and of limes. It is very striking in the case of limes. Great progress has been made in regard to the manufacture of the various products, but the lime plant remains where it was. The crux of the matter lies in what those who have to pay for investigations think most useful. Certainly an analysis of a plant's individuality is not likely to lead to a direct gain such as giving the same plant a dose of pen manure may, but it will be the means of preventing far greater losses through irrational treatment.

We have indicated in the foregoing that the planter must know his plant, and the extent to which he understands it, from the biological standpoint of course, will depend largely upon the work of the physiologist. This is inadequate in regard to the sugar-cane especially, and it might be more useful if a part of the large sums of money, now spent on manurial experiments, were expended in the direction of enquiring into the inner working of the organism itself.

SUGAR INDUSTRY.

TECHNICAL CONTROL FOR NATAL.

An important project for the benefit of the Natal sugar industry was outlined at the annual meeting of the Natal Sugar Association held recently at Durban. It was to the effect that a special branch of instruction should be started at the Durban Technical Institute for teaching the science of sugar cultivation and manufacture, and that chairs of Entomology, Bacteriology, and Chemistry should be founded, towards the cost of which the sugar industry should be asked to contribute two-thirds. A contribution of $\frac{1}{4}d.$ per cent. per month from both cane growers and mills on their output would, it was estimated, produce an annual income of about £3,750, which sum would not only be sufficient to defray the expenses of the special instruction referred to above, but also the cost of a cane-growing Experimental Station under the control of the industry.

This project, if carried out, should prove an inestimable boon to the Natal sugar industry ; the latter, though progressive in many ways, is admittedly rather backward as regards scientific control and co-operation. Technical assistants have at present to be procured from overseas, involving considerable delay when a vacancy has to be filled. Any plan which would obviate this and enable the Natalians to acquire the necessary scientific training within their own territory, would obviously result in a larger and more settled supply of trained labour ; for it is obvious that staffs introduced from Europe or from other cane sugar countries are not so prone to settle down and stay at a post in a foreign country as the native settler is likely to be. And the presence of three men in the midst of the industry, each an expert in his particular line, would offer the sugar interests facilities for investigation on scientific lines which could not but redound to the benefit of the industry as a whole, and might conceivably be the means of preventing, or at all events promptly scotching, some epidemic or other form of catastrophe which sooner or later visits every sugar-growing country. The cane-breeding station ought to be a particularly opportune addition to the resources of the planters ; for Natal has so far pinned its faith to but one variety, the Uba, and were this one to deteriorate suddenly through disease or sterility, the planters might be faced with the prospect of a most serious set-back. So far good fortune had aided them, but it would not be safe to assume that this would continue for ever. So the proposals to find the wherewithal to start a cane experiment station come none too soon.—(*The International Sugar Journal*, August 1915.)

SOME RECENT TOURS FOR THE STUDY OF FACTORY CONDITIONS.

This article is based upon three reports concerning tours in different parts of the world for the study of factory conditions in the sugar industry. The first which will receive attention is entitled A Note on Indian Sugar Industry and Modern Methods of Sugar Manufacture, by G. N. Sahasrabuddhe, Sugar Expert to the Department of Agriculture, Bombay. This valuable publication running into 113 pages is largely based upon information obtained by Mr. Sahasrabuddhe in the West Indies, where he spent two years under a Travelling Scholarship awarded by the Government of India. The course of study was followed under the direction of the Imperial Commissioner of Agriculture.

The Report seeks to enquire into the causes underlying the backward condition of sugar manufacture in India, and furnishes irrefutable information showing that the adoption of West Indian factory practices in many parts of India would be of vast economic value. With special reference to the Bombay Deccan, it is stated that this area is in a position to compete successfully in the matter of cane growing with the countries which import sugar into India. But as already intimated, in order to compete successfully in the market, sugar must be manufactured on a factory basis by means of modern machinery. The chief difficulty facing the establishment of central factories is the uncertainty of a regular supply of cane for the mill. The various methods by which this difficulty may be eliminated are fully discussed by the author. For complete security it is considered necessary that the factories should own a certain area of land and that they should enter into contracts with neighbouring growers for the supply of further quantities of cane.

Space will not allow consideration of the numerous details of interest which are to be found in the course of perusing this bulletin, but attention may be called especially to a table which appears on page 45, showing the efficiency of different milling plants in different sugar-growing countries, including the West Indies. This is reproduced, in part, in the opposite column.

The last column of figures are of greatest significance, the efficiency of the milling being highest where the juice lost per 100 fibre in the megass is lowest.

The second publication to which reference has been made is entitled The Manufacture of Sugar in Louisiana. This Bulletin, published by the Department of Agriculture, Mauritius, is by Mr. J. F. Clarenc, who was granted a travelling scholarship by the Government of Mauritius after leaving the Audubon Park Sugar School, Louisiana, to visit sugar factories of Louisiana, Cuba, Porto Rico and Java. The present report gives details of the methods of manufacture in the Louisiana sugar factories. In opening his report, Mr. Clarenc states that the Louisiana factories of which there are 210, twenty-three of these however, making cane syrup only, vary in their capacity from 300 to 2,400 short tons of cane per twenty-four hours. It appears that about 58 per cent. of the sugar-cane is grown on land owned by the factories, the remainder being purchased from planters or cane growers. The cost of transportation from the field to the factory is heavy, and operates in limiting the size of the factories. Reference is made to the system of loading and transporting, and to sugar-cane harvesters which are being employed in Louisiana.

The greater part of the report naturally concerns the equipment and working of the factories themselves. Reference is made to Louisiana boilers and furnaces, to sulphur apparatus and evaporators, double, triple and quadruple effects.

The third and last report is by Mr. Peter Abel, Representative of the Harvey Engineering Co., Glasgow, who was asked to visit India in order to ascertain the requirements of the country in regard to sugar machinery, and to advise the Government of India in connexion with sugar matters generally where such advice was desired. Mr. Abel's report is published as Bulletin No. 47 of the Agricultural Institute, Pusa. The most striking features of the report are its illustrations, which include some fourteen excellent photographs relating to sugar factories in different parts of the world. The subject-matter describes processes or methods in other countries, recommending their adoption in India. From a technical point of view it would have been more interesting if the important subject of milling had received more attention.

	Sucrose in cane per cent.	Fibre in cane per cent.	Sucrose extracted per cent. Sucrose in cane.	Dilution per cent. normal juice.	Normal juice lost per 100 fibre in megass.
Two 3-roller Mills.					
Antigua 1905	15·3	15·1	81·7	13·4	92·2
do 1906	14·1	15·2	82·7	9·1	103·2
Mauritius	13·9	11·3	85·5	14·1	111·8
Two 3-roller Mills & Crusher.					
Antigua 1907	14·4	15·1	84·4	21·1	80·4
do 1908	14·3	15·2	85·8	20·9	71·6
Demerara.	11·2	0·1	83·8	5·0	103·5
Three 3-roller Mills.					
Mauritius	13·9	11·6	87·7	12·3	96·4
do	14·0	12·4	92·5	26·4	76·4
do	14·1	12·0	90·2	15·8	64·5
Three 3-roller Mills and Cane Cutter.					
Mauritius.	14·4	12·5	92·0	17·5	37·4
Three 3-roller Mills and Shredder.					
Mauritius.	15·1	13·2	90·5	18·1	49·8
Three 3-roller Mills and Crusher.					
Mauritius.	13·5	12·5	90·9	18·3	59·5
do	13·5	12·7	89·3	12·4	67·5
Cuba.	12·2	11·7	93·2	17·6	49·1
do	13·4	11·2	85·2	19·2	97·9
Hawaii	16·2	11·4	90·5	11·0	70·3
do	16·4	11·4	93·2	33·9	49·7
Four 3-roller Mills and Crusher.					
Antigua 1911	14·1	15·8	85·7	14·4	70·3
do 1915	12·0	16·9	91·4	23·5	40·5
Hawaii	17·3	10·4	93·5	11·7	52·4
do	17·5	10·4	93·6	11·5	51·2
do	17·7	10·4	94·8	26·4	41·7
St. Kitts (1913)	13·6	15·1	91·0	28·3	46·2

NOTE. Certain of the figures relating to Antigua have been slightly altered in order to bring them into accord with information recently received from the factory in question.

WEST INDIAN FRUIT.

BLUE MOUNTAIN COFFEE.

Mr. A. St. Geo. Spooner, of Jamaica, has recently furnished this Office with a useful and interesting account of the famous Blue Mountain coffee industry of that colony.

Mr. Spooner gives consideration first to the quality of the soil producing this coffee. The lands on which the plant is grown are generally very steep hillsides, and in many places the soil is now insufficient (owing to denudation), and too poor to produce profitable coffee bushes, except in the little valleys and pockets where there is still depth and suitable quality of soil. It is stated that an estate having perhaps 1,000 acres at one time or another suitable for coffee might to-day find it difficult to maintain 100 to 150 acres. The soil is the product of the decomposition of shales, and is of no great depth anywhere, the more denuded lands being merely rotten shale, and hardly to be classed as soil at all. However, the coffee which is produced is well known to be of excellent quality. The prospect of obtaining profitable crops is stated to decrease with the elevation. For best all-round purposes 2,000 to 2,500 feet is the best; higher than that, although the quality of the coffee is better, the yield is smaller, and as the rainfall is often too heavy, the trees do not always flower except a period of drought happens to come in between the rainy spells. It appears that the seasonal changes experienced during the last few years have rendered the production of Blue Mountain coffee more precarious than in former years. At high elevations, namely over 2,500 feet, shade, except for very young coffee, is not desirable; at lower elevations it is indispensable. Another effect of elevation upon the plant is seen in the case of pruning. Coffee grown at high elevations is all pruned 'short top', whereas this pruning does not suit coffee in the lowlands. Mr. Spooner is of the opinion that the tendency of coffee at these rainy and colder elevations is to produce leaves and wood, and in order to ensure bearing well, a much more drastic pruning is needed. On the lowlands the rainfall is less, and it is desirable to have a larger tree, with a more extended root range. The pruning of coffee at different elevations is not a difficult matter, but it is too much a question of practical judgment to allow of description in this article.

Mr. Spooner then proceeds to describe the machinery used on some of the estates as long ago as 100 years. The pulper consists of a wooden roller covered with copper (indented) and turned by a mule. The cherries are forced between the roller and a hardwood block, whilst the beans are left on the hardwood block and fall backward on to a shaking riddle through which they pass into a stone cistern. The mucilage ferments from the beans in twenty-four to forty-eight hours assisted by the water which is run into the pulper all the time and in which the pulped beans lie. After fermentation the beans are carried out and dried. When quite dry—it takes about three or four weeks to reach this condition—they are put into a circular wooden trough in which runs a great heavy wooden wheel pulled round by a mule. The 'scrunching' action splits off the parchment; the beans are then winnowed and put back again under the wheel to 'scrunch' off the silver-skin. They are then winnowed again, sized in a rotary sizer and then hand picked to reject the inferior beans of each grade.

The above represents the old way of preparing coffee. The new way consists in using a much improved pulper, but constructed nevertheless on the same principles as the old. Further, after drying, the beans are hulled in a machine having a coarse-threaded screw working very loosely in a coarse-threaded nut: the space between the screw and the nut is where the parchment coffee is 'scrunched'. After winnowing, the coffee passes to many different forms of sizers, which not only separate the beans by virtue of their diameters, but also—which appears more important—sizes them according to their length. In a fancy article like Blue Mountain coffee appearance counts for everything, and a long bean having a good diameter is certainly an attractive looking article. The grades in one of the largest coffee houses of Jamaica are Peaberry, Nos. 1, 2, 3, 4, and Priage Nos. 1 and 2. Peaberry is produced by weak and old trees that produce a certain proportion of cherries having only one seed. which then becomes rounded something like cowrie. That this grade ranks so high is further evidence that plant vigour and good quality in coffee do not go together, just as in the case of sugar-cane cultivation, a certain degree of fertility, not too high, produces the best sugar-making juice.

According to Mr. Spooner the cultivation of the mountain coffee usually consists merely in weeding two or three times a year and pruning according to the season and soil, and irrigation sometimes every year, or once in two or three years. Agriculturally the coffee land of Jamaica seems to be greatly neglected. The tree is said to be a surface feeder, but it seems that in order to live on some of the lands it is at present found growing on it must have a very wide root range. The bushes are planted 4×4 feet on poor highlands to 6×4 feet on richer land. They begin bearing at about four years old. The young seedling plants are got from self-sown plants at the base of the growing bushes. No nurseries are made.

As regards yield to be expected, Mr. Spooner states that 266 lb. per acre per annum is considered very good. A small yield is not more than 100 lb. per acre per annum. Since there are 1,815 trees per acre planted at 6×4 feet, the yield per tree for a good crop works out at about only $1\frac{3}{4}$-oz. of coffee per tree per annum. The cherries are also measured in a box (1 foot 6 inches $\times$ 1 foot 6 inches $\times$ 1 foot 4 inches = 3 cubic feet)and this is supposed to give 1 bushel of dry coffee in the parchment or anything between 20 and 25 lb. of dried clean coffee fit for sale. Picking costs 1*s.* 3*d.* to 2*s.* 6*d.* per box (3 cubic feet) of cherries according to the crop, and a good picker in a good crop picks $\frac{7}{8}$ to 1 box per day. The finished coffee is put up in 100-lb. canvas bags, twenty-nine of which are a mule load. In Liverpool, the price is anything from 90*s.* to 120*s.* or even 130*s.* per cwt., but it is difficult to sell quickly. It is stated that it is not uncommon to have to wait six or eight months for account sales. Financing therefore becomes difficult. Peasant coffee is bought in the cherry at from 6*s.* to 12*s.* per box. The yield of about 200 lb. cleaned coffee per acre would be about $12\frac{1}{2}$ boxes of cherries. Mr. Spooner states that from this source the native in the coffee district derives what little ready money he needs. His principal requirements are met by the provision crops which he grows on his holding.

It appears that the mountain coffee districts of Jamaica are very sparsely populated and perhaps not 5 per cent. of the land is in any cultivation at all. It has to be borne in mind however, that the Blue Mountain coffee of Jamaica has established a name for itself because of its good flavour, and it seems a matter for regret that this cultivation is not given greater attention.

ACCLIMATIZATION OF THE TOMATO.

The Tomato Number of the *Philippine Agriculturist and Forester* (June 1915) deals, amongst other matters, with the results of acclimatization experiments

with varieties imported from Messrs. Sutton & Sons, London, and Messrs. Vilmorin-Andrieux, Paris. The following is a summary of the results in respect of the Philippines. The subject is believed to be of interest in the West Indies especially as a trade in tomatoes is being established with Canada.

1. Tomatoes, in this region on ordinarily level ground, are most profitable only when sown between July and October and, possibly, the earlier part of November. Tomatoes planted in other seasons need special care and are likely not to bear any fruit.

2. Of the thirty-two imported varieties, only eight could be made to bear fruit in one season. Of these eight, three are of the commercial type, and five of the small fancy types. The showing for these successful varieties was fair, considering the fact that this is the first time they have been tried in this country. Seed selections have been made from the healthier plants. It is expected that future generations will give better results as acclimatization proceeds.

3. The smaller fancy types were more successful than the large commercial varieties, apparently because the former approach the wild type more closely, and, therefore, are hardier and better equipped to resist adverse conditions than the more highly specialized commercial forms.

4. It was found that the tomatoes raised from seeds imported from France did better in this region than those from seeds imported from England. The apparent reason for this is that the former is a more southern country.

5. Due to the requirements of the plants in the way of intensive cultivation, it is not advisable to raise tomatoes on a large scale unless a large amount of labour, properly handled, is available.

6. A period of prolonged drought, and, likewise, a period of heavy and continuous rainfall will cause failure to set fruit.

7. A long rainless period retards growth on the characteristically porous soils of the College farm, in spite of occasional irrigation.

8. A period of sunshine following a period of rainfall results in an increase in the rate of growth.

9. A period of continuous heavy rainfall retards growth.

10. A period of light rainfall following a period of sunshine results in an increase in the rate of growth.

11. The season of the most rapid average growth of a variety is the season in which that variety will have the greatest field yield in fruits.

Eight first generation hybrids of maize and one wheat hybrid, together with their parent strains, were included in water-requirement measurements at Akron, Colorado, from 1912 to 1914. The hybrids ranged in water requirement from 10 per cent. below to 10 per cent. above the parental mean. On the basis of the results so far obtained, the chances are even that a maize hybrid will not depart in its water requirement more than 6 per cent. from the parental mean.

Cross pollination between individual plants of maize leads to results similar to hybridization of different strains, so far as water requirement and yield are concerned.

A wheat hybrid which had been grown for several generations gave a water requirement of 14 per cent. above the mean water requirement of the parental strains. (*Journal of Agricultural Research*, for August 1915.)

A Cotton Stainer Trap.—In connexion with the article on this subject which appeared on page 234 of this volume of the *Agricultural News*, Mr. Robson writes from Montserrat to say that he finds the form of collecting funnel described by Dr. Morrill in *Bulletin No. 86* of the United States Bureau of Entomology (p. 69) more convenient in use than that described and figured in the *Agricultural News*.

The device described by Dr. Morrill differs from the latter in that a tin cannister takes the place of the muslin bag, and the funnel is furnished with a flange which fits securely upon the cannister. A collecting vessel of this character admits of the use of liquid, such as water with a film of kerosene on the surface, whereby the captured cotton stainers are prevented from escaping: a very small quantity of water and kerosene suffices for this purpose, adding little to the weight.

Mr. Robson states that a convenient form in use in Montserrat is $6\frac{1}{2}$ inches deep and $6\frac{1}{4}$ inches across. The funnel constituting the cover is $3\frac{1}{2}$ inches deep.

Destruction of Flies by Means of Disease.—The following appears in the *Review of Applied Entomology*, Series B, Part 6, p. 89:—

'Hesse's experiments on *Mucor racemosus* which constantly resulted from attempts to cultivate *Empusa muscae* led him to try the former upon flies. He met with success both on captured and on bred flies, and polymorphism of these two fungi therefore suggested itself. Further and careful experiments only resulted in the constant production of *Mucor racemosus*. The author cultivated the fungus by Hesse's method on slices of yolk of egg sterilized at 100°C. from flies dead of *Empusa muscae* and made a series of experiments with it. All his flies, bred from insects in confinement, died of *Empusa muscae* and repeated culture from the dead flies yielded only *Mucor racemosus*. To remove the difficulty that the food supplied might have only stimulated the growth of Empusa spores already dormant in the bodies of the flies, two groups of flies were fed on syrup containing spores of *Mucor hiemalis* and *Mucor racemosus* respectively, and all died with the usual signs of *Empusa muscae* as the cause. The controls lived on and died naturally without exhibiting any such signs. Hesse's observations are thus confirmed. Trials have been made of fly-papers smeared with syrup infected with spores of *M. racemosus* and the impression was that a marked increase of fly mortality took place. Manure containing larvae was sprinkled with the same syrup and none of the larvae matured.'

Trees Lost in Dominica Botanic Gardens During Recent Storm.—The following is a list of the species of trees lost in the Gardens during the recent storm in Dominica. Plants or seeds of the species named would be welcome at the Gardens: *Prioria copaifera*; *Tecoma suberosa*; *Treculia africana*; *Spachea perforata*; *Enterolobium Timbouva*; *Enterolobium cyclocarpum*; *Peltophorum ferrugineum* and *Couratari exigua*.

Fortunately the list is a small one. Mr. Joseph Jones, the Curator, points out that it would have been a long one, had he not in past years followed a system of planting duplicates whenever possible. Many fine species of trees other than those in the list have been lost, but in almost every case the duplicate species was uninjured.

WEST INDIAN BAY OIL.

The article which follows appeared as an editorial in the *Perfumery and Essential Oil Record* for August 1915. It conveys an appreciation of what is being done in the British West Indies to increase the production of bay oil of good quality and makes useful suggestions concerning its valuation and uses:—

Subject-matter before us on bay leaves and oil provides food for reflection in a number of directions. First, as is well known, we have during the last few years earnestly urged, as a general principle, the extension of aromatic plant cultivation in parts of the world where climate and soil lend themselves to suitable propagations. But this broad advocacy of a wise policy has been conditioned, directly or implicitly, by considerations of present sources of supply of, and the ruling market conditions in, any particular oil under consideration. Now this propagation propaganda, because it in a measure accords with their pre-conceived ideas, has engaged the attention of agricultural authorities in some of the West Indian islands, particularly in respect of bay leaf. The excellent quality of the Porto Rico bay oil and rum needs no extolling, and they find a large consumption in the United States. Again, during comparatively recent years a growing trade in bay rum, notably with Central America, has been developed in the Danish island of St. Thomas, due partly to the good supply of bay leaves from the neighbouring island of St. Jan (no leaves being grown in St. Thomas), and partly to the low import duties on rum and alcohol in the latter island. But, as Mr. W. C. Fishlock, the Agricultural Instructor at Virgin Islands, in a brochure alluded to in the *Perfumery and Essential Oil Record*, December 1914, stated, there appears no reason why the British West Indian islands should not participate in the oil trade if handicapped by fiscal conditions from joining in the bay rum industry. Bay trees of the proper variety are found in Antigua, Barbuda, Dominica and Montserrat among other islands, and the agricultural officials there have in late years taken steps to free both the leaf and the oil from the suspicion that careless collection and distillation formerly imparted to them. The Government experimental plots and attention to distillation have led to more extended cultivation in some of the islands of the right kind of trees (*Pimenta* or *Myrcia acris*), and there has also been a proposal for Government certification of the resulting oil.

Having made distinct advance towards the production of the oil in a well-regulated manner, and in view of a marked disposition (notably in Montserrat) to plant considerable areas, the agricultural officers are naturally concerning themselves keenly with the possible outlets for the potential increased production. To avoid overproduction is a first consideration, especially in the case of an oil at present used practically for one purpose—bay rum. As a source of eugenol, bay oil, as we pointed out last month, could not compete with clove and cinnamon leaf oils, and it is obvious that it would have to find employment in other directions. Having regard to its delightful fragrance, we think a coniderable extension of its use could be found in soaps and other toilet articles, and we hope to hear of British makers giving it a fair trial.

Another aspect of the question which enters into the commercial considerations of the Colonial planters is the valuation of the oil. To purchase bay oil solely on phenol content is not encouraging to the honest producer in that it provides an opening for sophistication by unscrupulous dealers with eugenol from clove oil or cinnamon leaf oil, just as cinnamic aldehyde from a cheap source may be added to true cinnamon bark oil. We have only to recall the remarks of a certain American writer (reproduced and condemned in the *Perfumery and Essential Oil Record*, July 1910) to appreciate how ready people are to fall into and justify this kind of faking. Arguing that an impure oil may sometimes be of better quality than a strictly pure oil, he said: 'An oil of cinnamon bark low in aldehyde may be, and possibly often is, improved by the addition of aldehyde from other sources, or an oil of bay deficient in phenol, as frequently happens, may be brought up to the standard by judicious admixture with eugenol obtained elsewhere.'

No! oils must be judged not alone by the content of one particular constituent, but by all their chemicals, physical and oil factory factors. We lately had before us two bay oils—one containing 45 per cent. phenols and the other (1*s.* per lb. more) 55 per cent., but the delightful odour of bay oil was much more marked in the former than in the latter. There is, in fact, no question that bodies present in small quantities give certain oils their distinctiveness, and in many cases their value—bay oil being such an one. Its perfume is materially influenced by the proportion of constituents which modify the eugenol odour, and of these constituents myrcene in its original or polymerized form plays no insignificant part, not only in respect of odour but of specific gravity and other physical properties. The considerable differences in the bay oils of commerce indicate the urgency of the investigations we have in hand on the changes taking place on exposure of myrcene, which probably cause the marked variation in specific gravity compared with eugenol content—a variation very much wider than in the other eugenol-containing oils such as clove, pimento and cinnamon leaf. We hope that such investigations as this, and the official efforts in the West Indies to bring the production of this oil within controlled conditions will narrow down the difficulties in the valuation of the oil by its tests and by its characters.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

GRENADA. Mr. J. C. Moore's notes on agricultural affairs during August show that much attention is being given to the question of lime cultivation in Grenada. Of importance in this connexion is the selection of a few acres of land near the Botanic Garden for experimental cultivation. Mr. Moore has visited several country districts in connexion with the development of the lime industry, and he states that local interest is growing and that good progress has been made in planting operations. During August 5,325 lime seedlings were distributed for planting on estates.

As regards the condition of the staple crops, cacao is reported satisfactory and early. In August the spice crop was coming to a close with a reduction on last year's return.

A coming event of interest at the time of writing was the judging of holdings in the cacao prize-holdings competition which was to take place in September.

The weather was rainy throughout the month, and the average precipitation at twenty-seven stations was 12 inches.

ST. VINCENT. Work in the Experiment Station during August consisted principally in sowing plots of Indian corn, and in work connected with pests of ground nuts and Indian corn. Observations relating to the staple crops indicate that early planted cotton has suffered from boll shedding and angular spot on account of the rainy weather. Indian corn has yielded satisfactory returns. This crop is chiefly grown as a catch crop with cotton. Coco-nuts in the Carib country

are making good progress. The statement is made that at one estate cacao was not so badly attacked by thrips as it was four months ago, that spraying on this cacao is still in progress. Reference in connexion with thrips should be made to Insect Notes published in this issue of the *Agricultural News*.

A considerable amount of visiting and inspecting of growing crops was done in the Windward districts, and the Assistant Agricultural Superintendent visited Bequia for the purpose of distributing seed corn to the small growers, whose crops had been destroyed by the army worm. Another object was to start a small corn demonstration plot.

The kiln drier for corn installed at the Government Cotton Ginnery was to be started in September, and the purchase of corn on a profit-sharing basis will be commenced. The weather during the month was wet, 13·78 inches having been recorded at the Botanic Station.

As regards work in the Botanic Gardens, it is of interest to record that the Victoria Regia seedlings germinated in the basin for aquatic plants. A supply of 'millions' bred in the basin was sent to one of the island estates. This basin will afford a useful breeding ground from which millions can be regularly distributed.

ST. LUCIA. A communication from Mr. Brooks furnishes the information that work in the Experiment Stations has included the distribution and transplanting of lime plants, the planting of coco-nuts, and various estate improvements including the laying out of new roads. Observations relating to staple crops show that in the case of cacao, picking was in progress and that the crop is normal. The lime crop was in full swing and the return also normal. The cane crop was making good growth. From the Government lime juice factory 16 casks of concentrated juice were shipped during the month.

The following is a list of the plants distributed from the Agricultural Department's nurseries during August: limes, 4,300; cacao, 50; oranges, budded, 6; nutmegs 27; decorative, 14. This gives a total of 4,397.

The rainfall at the Agricultural and Botanic Station was 7·88 inches, while at the Botanic Gardens it was 21·20.

In a separate communication received from Mr. Brooks it is learnt that a proclamation has been issued forbidding the importation of citrus plants from the United States on account of the existence of citrus canker in that country.

DOMINICA. Mr. Joseph Jones informs this Office that it is to be feared that many estates suffered considerably from the recent storm. Considerable quantities of immature fruit were blown down and it is anticipated that the present year's crop will be lower than usual. These remarks however are only provisional; an accurate estimation will not be possible until a tour of the island is completed by the Agricultural Officers. Later advices tend to show that the damage done was less than at first anticipated.

Dr. Tempany visited the island from August 21 to 27, devoting his time to chemical problems.

In the lime and cacao experiment stations as well as in the Gardens much of the work during August consisted in the clearing away of refuse and in efforts to prepare the damage done. In the nurseries work connected with the raising of plants was carried on as usual and an event of some interest was the despatch of a wardian case of grafted mango plants to the Agricultural Department in British East Africa.

The rainfall for the month of August was 14·74 inches.

MONTSERRAT. Several interesting items are contained in the August communication sent by Mr. Robson. The value of spraying ground nuts with Bordeaux mixture has again been demonstrated and the yield of this crop has been excellent. It is stated that thirty rows of *Carum copticum*, the ajowan plant, recently introduced, are growing well and that the plants are beginning to flower.

The reaping of cotton began about the middle of the month and the crop promises to be at least up to the average. So far it has been a good lime year and satisfactory crops are yielded by the healthy fields.

No less than 290 lb. of onion seed was received during the month and this was distributed amongst 150 growers. Two meetings were held in connexion with the Onion Growers' Association, of which the Curator is Honorary Secretary. Rules have been passed, printed, and will be circulated to growers. Applications for membership must be received by October 31. A meeting of the Association was held on September 1, when it was decided that all onions must be plaited and have been dried for at least seven days before delivery. From this it would appear that onion cultivation is to occupy an important position in the agriculture of Montserrat in the future.

Mr. Robson makes reference to experimental work with cotton which has included a continuation of his observations concerning stainers.

ANTIGUA. Mr. J. Jackson says the cane crop still continues to look promising. If good weather continues it is expected that a record crop will be made in 1916. Last crop, 8,390 tons of crystals were made at Gunthorpes and 1,283 tons at Bendals. Of cotton 80,000 lb. was shipped as last season's crop.

The work of planting trees around Wallings reservoir has been completed.

Several mertings of agricultural interest were held during August: these included a meeting of the Board of Management of the Onion Growers' Association and two meetings of the Agricultural Society.

In the experiment stations the cultivation of sugar-cane variety plots has been begun and Agave plots at Colebrooks prepared. A corn meal maker has been erected.

In a letter from Dr. Tempany it is understood that at a meeting of the Agricultural Society he read a paper on the subject of co-operative insurance in West Indian agriculture. The paper was published in the issue of the Antigua *Sun* for September 6, and appears to have attracted some attention locally. An abstract of this paper will appear in due course in the *Agricultural News*.

ST. KITTS. According to Mr. F. R. Shepherd, the present condition of the sugar-cane crop is very satisfactory and there is every prospect that the returns per acre will be greater than they have been in recent years. The cotton crop has suffered from too much rain causing the plants to run to wood at the expense of the boll. The trees are, however, very healthy. During August picking commenced in the earlier planted fields. Appended to Mr. Shepherd's observations is a summary of a chemical work conducted by Mr. Waterland. This has included manurial valuation of white ash from the central factory; determination of carbonaceous matter and moisture in black ash from the central factory; analysis of three samples of milk from the police and six samples from other sources; preparation of soil samples and estimation of organic carbon in soils together with determinations of soil shrinkages.

NEVIS. According to Mr. W. Howell, the cane crop continues to make good progress. The cotton in exposed situations was badly damaged by the recent storm. Work in the Experiment Station has consisted principally in tending cotton and bean demonstration plots, and in the distribution of plants.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number urges the importance of studying the individual plant in tropical cultivation. Reference is made to the work that has been done on cotton, coco-nuts and rubber, while attention is called to the neglect of the sugar-cane.

Sugar Industry contains an interesting article on some recent tours for the study of factory conditions.

Under the heading of West Indian Fruit, on page 308, will be found a hitherto unpublished account of Blue Mountain Coffee in Jamaica.

An appreciative article published by a contemporary on the subject of West Indian bay oil appears on page 310.

Contents of Present Issue (*Concluded.*)

A considerable amount of space is devoted to items of local agricultural interest in this issue. on page 310.

Under Insect Notes, on page 314, will be found two important articles. The first is by Mr. W. Lawrence Balls on the subject of the internal disease of cotton seed. It is indicated in this that the damage done by stainer bugs to seed is less due to the nutriment they remove than to the poisons which they leave behind. Secondarily, fungi and bacteria may gain a foothold and cause complications. The second article by the Entomologist of this Department indicates that thrips on cacao constitute a 'danger signal' rather than an actual pest.

A review of the Report on the Agricultural Department, Dominica, 1914-15, just issued by this Office will be found on page 317.

Fungus Notes, which will be found on page 318, comprise two articles: diseases of citrus in the Isle of Pines, which is a review of the first Annual Report on the new Citrus Pathological Laboratory, San Pedro; the second concerns the important subject of die-back of lime trees in Montserrat, in which reference is made to the first article.

Mr. J. L. E. R. Lake.

At a recent meeting of the Antigua Agricultural and Commercial Society, a resolution was passed to the effect that 'the Society desires to place on record its deep regret at the death of Mr. J. L. E. R. Lake in the service of his country with the British Expeditionary Force in the Dardanelles, and tenders to the relations of the deceased officer its sincerest sympathy in the deep and irreparable loss they have sustained.'

This opportunity is taken of participating in the foregoing resolution, and of expressing regret at the death on active service of an officer formerly associated with this Department.

Mr. Lake joined the staff of the Government Laboratory, Leeward Islands, in September 1907, and left to go to McGill University to study engineering in September 1911. At the outbreak of war he went to England and obtained a commission as second Lieutenant in the Border Regiment.

He had previously been slightly wounded and returned to the firing line. He was reported wounded on August 22, 1915, and died in hospital on August 24.

The Double Coco-nut Palm in the West Indies.

At the last Agricultural Conference, held at Trinidad in 1912, a specimen of the fruit of the double coco-nut or coco-de-mer (*Lodoicea sechellarum*) was exhibited, which had been grown in the British Guiana Botanic Gardens. The exhibit possessed all the greater interest because, as was explained, the specimen shown was probably the first example of the fruit

produced in the Western Hemisphere. A suggestion was made, however, by the Hon. J. S. Hollings, of Nevis, as to the possibility of the fruits having been produced, in past years, in St. Kitts:—no confirmation of this was at the time available.

It is of interest to place on record the fact that seeds of the coco-de-mer were sent to St. Kitts as early as 1872 by Mr. N. Darnell Davis from Mauritius. Most of these were not successfully grown but one was established at Lamberts estate, though it was injured and killed by a gale of wind when about three years old. Thus although St. Kitts holds the record as regards priority in the matter of introducing the coco-de-mer, there is definite evidence to show that no plant produced fruit in that island.

A few years ago germinating nuts of the coco-de-mer were introduced into St. Lucia, Dominica, St. Vincent and Grenada. The greatest success has been obtained in Dominica where two of the plants have become well established. So far these have not yet produced fruit.

We are indebted to Mr. Joseph Jones, Curator, Botanic Gardens, Dominica, for the facts concerning St. Kitts, which were contained in a personal letter recently written by the Hon. B. S. Davis, of that island.

Excess of Lime Method of Water Purification.

Embodied in a review of a report on water-supply researches appearing in *Nature* (August 19), is an interesting account of how water may be both softened and rendered sterile on a large and in expensive scale.

The hardness of water is chiefly due to bicarbonate of lime (temporary) and sulphate of lime (permanent), the former being kept in solution by the carbonic acid present. In the softening of water lime is added and combines with the free and semi-combined carbonic acid, causing a precipitation of the lime added and of the bicarbonate of lime in the water in the form of the relatively insoluble carbonate of lime. A water treated with the right amount of lime has no caustic alkalinity and has practically no action on the bacteria present. When more than enough lime is added the water is rendered caustically alkaline and becomes actively bactericidal. Such a water would, however, be unfit for domestic and trade use, but if the excess of lime present be removed by the addition of a sufficiency of water from which the bacteria have been removed, the whole of the mixed water will be softened and purified, and will be satisfactory for all purposes. It has been previously shown that if raw river water be stored from four to five weeks the great majority of the bacteria are removed, and the water is rendered safe for drinking purposes.

The excess lime method of purification consists, then, in the addition of an excess of lime, storage of the alkaline water for a day or thereabouts, so that the bactericidal action may be exerted, addition of a sufficiency of water, purified by storage, to neutralize the excessive alkalinity, and filtration to remove the precipitated carbonate of lime.

Ajowan Seeds for Thymol.

Attention was called in this journal some months ago to the fact that prior to the present war practically the whole of the world's thymol supply was obtained from Germany, which imported for this purpose large quantities of ajowan seed (*Carum copticum*) from India. In view of the increased demand for thymol as an antiseptic at the present time, it has since been suggested that certain of the British colonies should grow ajowan seed with a view to exporting it to England and elsewhere for the production of thymol, and recently seeds have been obtained from Kew and distributed to the Windward and Leeward Islands. The chief matter, however, to which we desire to refer in connexion with thymol is that its production is being considered in the United States. In the *Perfumery and Essential Oil Record* for August 1915, a report presented to the Department of Commerce on the possibility of production in the United States is reviewed from which we are able to glean certain facts of interest. For instance it is stated that the only plant indigenous to the United States susceptible of use as a source of thymol is horse mint, but this does not appear suitable for commercial purposes. The report goes on to say: 'if any effort is made to establish the industry in the United States, the first step should be to secure a regular supply of ajowan seed from India or Egypt. . . . There appears to be no doubt that a large stock of seed is now available in India.'

Electricity for the Estate.

The book to which this note refers is entitled Electricity for the Farm, published in New York, which means that it is intended primarily for the American farmer. This does not make its contents any the less interesting and suggestive in regard to the West Indies. A good review of the work will be found in *Nature* for August 19, and in this the following points are referred to as receiving careful attention in the book: measurement of the power of a stream of water; the construction of dams; the working of a dynamo and motor; how to compute the power required for lighting houses of certain sizes and for motors for doing small or large domestic or farm work. On practical methods—types of lamps, sizes of wire, wire joints, Ohm's wiring the house and premises, etc—the author gives good simple instruction. The last quarter of the book is less important; it is intended for farmers who have no water power. It describes gas engine plants and accumulators.

The review referred to ends with the following remarks: 'The American farmers have a respect for natural science and they are glad to cultivate new ideas. We think that the publication of this book will induce such men and their families to begin a fascinating study at small cost, which results in comfort and the widening of a mental horizon which ought to fill the town dweller with envy.'

INSECT NOTES.

NOTES ON AN INTERNAL DISEASE OF COTTON SEED.

By W. Lawrence Balls, M. A. (Cantab.).

As a supplement to the articles on The Internal Disease of Cotton Bolls in Nos. 344 and 345 of this Journal, it may be of use to its readers to know of some similar unpublished observations made incidentally by the writer in Egypt, in connexion with pure-strain seed-supply, during which the diseased condition of some seed was traced quite definitely to a Cotton Stainer Bug (*Oxycarenus hyalipennis*).

The circumstances were such that it was easy to fix the responsibility. They were as follows: the Giza Cotton Station is on a site which has always abounded with the bugs; there were hundreds of stored samples of seed from 1905 to 1912, all marked with the date of picking, and the exact site in which they were grown. In the season of 1912 pickings were made on every day of the season (September-November), and picking was continued from mid-August until January; moreover, some of those pickings made during the winter consisted of cotton which had been allowed purposely to hang on the plants since it first ripened. Lastly, every main group of cotton was represented. Statistical data were available as to the life-history of almost every plant and plot concerned, and all microscopical examination was conducted on the spot by the writer, with the usual refinements of technique.

It will suffice to state the main results, and the obvious conclusions. The percentage of seed which failed to germinate was proportional to the duration of the time during which the seed-cotton had been hanging on the plant, at any one season of the year. For equal times of exposure the severity of the damage was proportional to the abundance of Stainer Bugs. The proportion of damaged seed in extreme cases rose to 98 per cent. Examination of seed which had failed to germinate showed a brown discoloration of the embryo root in the earliest stage, this discoloration subsequently extending, though never involving the whole embryo; the localization of the disease to this part of the embryo corresponded with the fact that the bugs accumulate for feeding round the point of the seed where the lint is most scanty, and are but seldom found feeding on other parts of the seed-coat.

Since it seemed at first unlikely that the puncture made by the bug should in itself cause the death of the embryo, (or rather, of its root, which comes to the same thing in practice), damaged seed was examined in various ways for fungi and bacteria which might have been introduced through the punctures. The anthracnose fungus was suspected, since it is very common in Egypt, though not a serious pest, but it was finally found that neither this fungus, nor any other, nor even bacteria, were habitually present in the damaged embryos. The brown portions consisted of cells in various degrees of unhealthiness on the margin, with dead and disintegrated cells near the centre, only the cell walls being normal. The parts of the embryo which were normal in appearance consisted of normal live cells.

Further tests made by exposing healthy seed to the bugs for a week or two showed clearly that the saliva of the bug, like that of most other bugs, was in some way poisonous, and that for some time after the proboscis of the bug had been withdrawn it continued to destroy the cells with which it came in contact. So far as the writer is aware, no specific statement of the poisonous nature of this cotton stainer bug's saliva has yet been made. Circumstances prevented the writer from completing the investigation by ascertaining the nature of the poison.

Summing up, it was evident in the case of the seed, and is probable in the case of the boll as a whole, that the damage done by stainer bugs is less due to the nutriment they remove than to the poisons which they leave behind. Secondarily, fungi and bacteria may gain a foothold and cause complications through the punctures which the bugs make. Lastly, on the same plant seeds and bolls may be diseased in all these ways, and also by specific parasites such as anthracnose.

WHAT CACAO THRIPS SIGNIFY IN GRENADA.

A species of this insect (*Heliothrips rubrocinctus*, Giard.) has been known to occur in Grenada since 1898. It has from time to time been the subject of correspondence between this Department and the Government of Grenada, and it has been considered a pest of cacao by planters and others.

At the present time thrips probably occurs in all parts of Grenada, and perhaps in every cacao field. It was, however, only in certain fields and often in small areas in those fields that planters considered that damage resulted from attack by thrips. The remarkable thing about the occurrence of thrips is that attacks occur year after year on the same areas, on the same trees even, sometimes spreading a little; but a thrips area one year is liable or certain to be a thrips area every year.

Cacao thrips in Grenada has been the subject of observation by the Entomologist of the Imperial Department from 1900 to the present time.

It appears that a sufficient amount of information is now available to enable a general statement to be made as to the economic status of cacao thrips.

Lefroy stated in paragraph 5 of the report of his visit to Grenada, dated October 3, 1900, that the discoloration of the pods which results from thrips attacks, makes it difficult to tell when they are ripe, and that this increases the cost of gathering, since the pods have to be tapped or scratched in order that the pickers may be able to see the real colour of the pod. Otherwise this insect does not appear in any way very injurious or troublesome, and none but a very simple remedy would be worth adopting.

Later Lefroy summarized the situation in the following words: 'Thrips may be regarded as a possible enemy to cacao rather than as an actual pest. There does not appear to be any serious cause for alarm at the present time and the chance of the cacao suffering materially from the attacks of this insect is, in my opinion, remote.' (*West Indian Bulletin* Vol. 11, p. 185.)

These opinions appear to be applicable at the present time, the experience of cacao planters during the past fourteen years having served to confirm the early belief as to the nature of the attacks.

At the same time, however, it must be stated that the cacao growers still refer to the injury done by thrips, and they recognize on their estates certain fields, or patches in fields, where thrips attacks occur year after year, and they also want to know what remedies to employ to check the thrips.

Formerly the impression prevailed that the cacao thrips was always most abundant during dry weather, and that wet weather was favourable to the plants and unfavourable to this insect. This idea is based on observations, corres-

pondence and interviews with planters and others; it has been put forward in departmental publications and at Agricultural Conferences from time to time during the past few years, and no exception to the general idea has ever been taken. In the circular on Cacao Thrips by F. W. Urich, published by the Trinidad Board of Agriculture, the same belief is expressed.

As a result of a recent visit to Grenada made by the Entomologist and Mycologist of this Department, the opinion is formed that in Grenada, especially on those estates which lie on the lower lands around the periphery of the island, the cacao thrips is most abundant during the last three months of the year, October, November and December, and that in the dry months a considerable improvement in the condition of the trees takes place.

With regard to the nature and the amount of injury caused by thrips, it was found that generally speaking, planters notice only the injury in terms of pods picked too green and of labour, and time lost in scratching the pod to see if it is ripe enough to be picked.

It is true that in some instances thrips is credited with causing the leaves to fall and with preventing the development of pods, when these are attacked while very young, and it appears that in a few instances thrips is believed to have killed trees out-right.

Thrips live and feed on the leaves and pods of the cacao. When leaves are attacked they may be so seriously injured as to cause them to drop, but unless the entire crop of leaves were destroyed and the destruction repeated in a short time, it does not seem to me as if the tree would be seriously injured, and it certainly would not be killed from that cause alone. The attack of thrips on the growing pods would not have any effect on the health and vigour of the tree, even if all the pods were killed. The effect would be entirely an effect on the crop. In most instances planters have spoken of a severe thrips attack as being a time when thrips were abundant on the pods, as a result of which pods were badly discoloured. Planters have been asked to state how much injury to crops have been caused and how much permanent damage has been done to the trees. In nearly every case the answer has been that very little shortage of the crop is traceable to thrips attack and that the few leaves which fall are quickly replaced by new growth, but the loss occurs in the pods picked before they are ripe, and in the loss of time by the pickers, who often have to examine nearly all the large pods on a tree in order to know which are ready for picking.

A remarkable unanimity of opinion appeared to prevail among Grenada cacao planters in regard to the occurrence of thrips. In every instance where thrips attacks or the effects of thrips were seen, it was stated that 'this piece gets it every year', and in every instance something besides thrips could be shown to be wrong with the trees. Before considering what these things are which are wrong with the trees, four points may be discussed with regard to the cacao thrips in Grenada as follows:—

(a) Thrips are present throughout the island, and at certain times it is doubtful if on those estates where outbreaks of thrips occur, there are any trees which are entirely free from this insect.

(b) Thrips in the adult stage are capable of flight and the young are active enough so that they might be carried from tree to tree by birds and large insects.

(c) Thrips attacks occur on the same limited areas year after year.

(d) Thrips is a dry weather and a dry locality insect as a general thing, and yet in Grenada it generally becomes most troublesome toward the end of the wet season.

In the case of an insect (a) which is at all times well distributed throughout the island, (b) which can migrate and can be easily transported, it is remarkable (c) that their attacks should always occur on limited areas and on the same areas year after year and (d) that these attacks should occur in the wet season, which would be expected to be the time when the plants would do their best and the thrips would be reduced in numbers.

It seems to be generally accepted that thrips may be present year after year in cacao and never increase in numbers sufficiently to attract attention or to cause any injury.

For several years the conviction has been growing that the so-called attacks of thrips indicate that something is wrong with the plant, or with the conditions under which it is growing. It is now suggested that thrips in Grenada at least ought to be considered a useful insect, because it is a certain indicator that the trees are suffering from untoward condition. Thrips might well be called a danger signal, a watch dog, or a trouble indicator, but should not be called a pest. To explain this statement, it may be stated that when thrips areas were examined, it was found that root disease was present, or that the drainage was insufficient, or the soil was shallow with terrace or heavy clay beneath, or there was evidently a lack of humus in the soil.

Root disease is the result of the action of a specific organism which produces a well-known and recognizable effect in cacao. Its attacks seem always to be accompanied by thrips, which probably indicate the area of infection by root disease better than it can be determined in any other way. The worst affected trees, probably in the centre of the infected patch, will be dying wholly or in part, and of course the effect of root disease is easily to be seen in such cases, but on the edge of the root disease patch, where its effects might not be easily seen, the thrips will almost certainly be found to decrease in numbers. In dealing with root disease accompanied by thrips, the extent of the area to be isolated will probably be accurately indicated by the extent of the thrips attacks. Root disease probably produces a physiological upset in the cacao tree long before it causes the death of the trees or even of many of the roots. This condition is favourable to thrips, and results in their increase in numbers. Cacao trees growing in soils not properly drained are also subject to physiological upset and consequently to thrips attacks. I was shown several instances where thrips areas had been rendered free from thrips attacks by improved drainage. In this connexion, the conviction is expressed that on some estates in Grenada, at least there is room for much improvement in drainage. Drains should allow rain and soil water to thoroughly saturate the soil and at the same time they should provide ample means for the quick run-off of all surplus water. For this purpose contour drains are to be preferred to drains running straight down the slopes. The depth of drains varies according to local conditions, and it may happen that on lands which seem to be sufficiently well drained, thrips occur year after year.

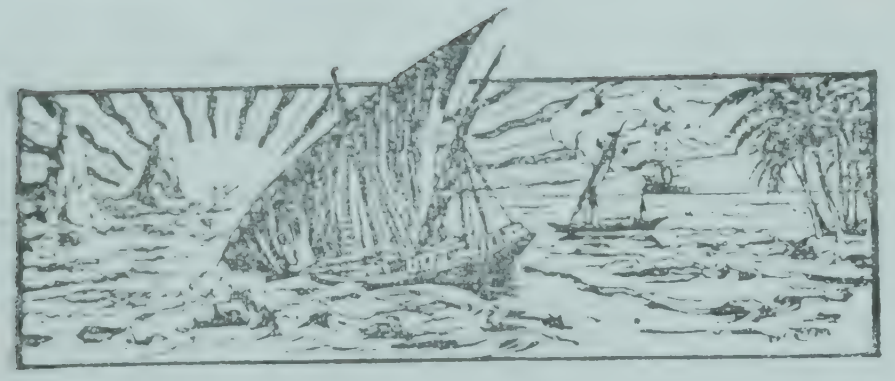
In such cases it is possible that merely deepening the drains will restore the trees to health and reduce the severity of thrips attacks.

Lack of proper drainage is considered to be one of the most frequent causes of unhealthy trees and attacks by thrips.

Root disease is caused by a specific organism and requires definite treatment. As already stated thrips attacks sometimes, perhaps often, indicate not only the presence of root disease, but also the area attacked by it.

Directions for the treatment of root disease are given in the *Agricultural News* for July 31, last.

H. A. B.



GLEANINGS.

It is stated in the *Chamber of Commerce Journal* (August 1915) that a new steamship line has been established between Hull and the Congo. As a result, a new trade in tropical products is expected to be brought to the above mentioned port.

Reference was made in the last issue of the *Agricultural News* to a review of the Official Guide to the Botanic Gardens, Dominica, which appeared in *Nature*. To this may be added the appearance of another appreciative review in the Kew *Bulletin of Miscellaneous Information*, No. 6 of 1915.

A useful and suggestive Bulletin has been issued by the United States Department of Agriculture (*Farmers' Bulletin* No. 667) dealing with the breaking and training of colts. The bulletin is fully illustrated and is likely to prove very helpful to those who are engaged in breeding horses.

A report on the season and crops of Assam, 1914-15, has been received in which it is stated that in regard to sugar-cane the season was favourable. For cotton the conditions were somewhat adverse. The estimated outturn of sugar-cane was 95 per cent. of the normal against 99 per cent. in 1913-14.

A notification appears in the *Gardeners' Chronicle* for August 7, 1915, to the effect that Mr. W. B. Brierley, M.Sc., of the University of Manchester, has been appointed by the President of the Board of Agriculture and Fisheries a first class assistant in the Plant Pathology Laboratories of the Royal Botanic Gardens, Kew.

According to the *India Rubber World* for September 1, 1915, the acreage of the growing crop of American Sea Island cotton is reported to be larger this year than last; the estimates vary from 20 to 25 per cent. Generally speaking, the new crop has a good start under favourable conditions that would point to a good average crop.

It is learnt from the *Kew Bulletin of Miscellaneous Information*, No. 6 of 1915, that a new species of Cryptocarya has been received from South Africa and it has been determined as *C. vaccinii folia*, it forms a tall tree, 80 to 90 feet high and the crowns are dense, well shaped and picturesque. It should prove exploitable for furniture making.

The issue of the *Journal of Heredity* for August 1915 contains several very interesting features including an article on the mangosteen by Dr. David Fairchild, and an article describing a working model of mendelism. This latter consists in the employment of two packs of playing cards for the demonstration of the principles of mendelian segregation.

A large shipment amounting to 758 lb. of onion seed arrived at Antigua by the S.S. 'Guiana' on August 23, for distribution in the Leeward Islands. From this it is to be expected that the area under onions in the Leeward Islands will be much greater next year than in former ones. Reference is made to developments in onion growing under 'Down the Islands'.

The *Produce Markets Review* (August 7, 1915) furnishes the information that a good proportion of the lemons arriving from Sicily have been in poor condition. On the other hand, shipments of oranges recently arriving from South Africa show a greatly improved condition, and a good demand is raising prices. In Liverpool, the stocks of ground nuts have been much reduced and as recent arrivals are suitable only for the extraction of oil, there is a serious shortage.

Important results are published in a paper on the bionomics of *Glossina palpalis* of Sierra Leone with reference to its pupal habitat, in the *Annals of Tropical Medicine and Parasitology*, Vol. IX, No. 3. It appears that the ground around the trunk of oil palms (*Eloeis guineensis*) which have not been stripped of their lower petioles constitutes an excellent breeding place; in fact this insect can breed in localities in which practically the only tree is the oil palm. Stripping the oil palm of the lower petioles would suffice to destroy the breeding ground in such localities.

The Times for August 12, 1915, urges the substitution of brown sugar for white. It states: 'custom has prescribed the use of loaf sugar for purposes which other sugars—granulated, Demerara, Barbados, or Java—would do equally well, and in some of the large stores customers are being advised to substitute brown sugar, of which although economy in its use should be exercised, there is at present sufficient to meet reasonable demands.' It will be realized that the foregoing advice will help to exercise a favourable influence upon the demand, for direct consumption, of raw West Indian sugars in England.

It is stated in the *India Rubber Journal* (August 7, 1915) that the buoyancy of kapok which is now being used for lifebelts, appears to be due to minute air bubbles which cling to the fine fibres of the material, and the weakness of the material for the purpose mentioned lies in the danger of the removal of these air bubbles by mechanical agitation. If the kapok is enclosed in porous envelopes these bubbles escape and cannot be recovered on drying, so that the buoyancy is very greatly diminished. What is needed therefore, is a good waterproof covering: hence the relation of kapok to rubber is not one of antagonism, but of mutual helpfulness.

DOMINICA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1914-15.

The first section in this report provides information on plants in the Botanic Gardens, including an interesting class of native plants employed for the purpose of stupefying fish. The fruits of the tree known as Bois Bambarra (*Diospyros Ebenasta*, Retz.) are amongst those used for this purpose. This interesting tree has only recently been identified in Dominica to which island it is believed to be indigenous.

The section which follows the above concerns work in the nurseries and the importation and distribution of plants. The total number of plants sent out during the year was 67,042, of which 65,170 were limes. Plant importations have included six varieties of selected mangoes from India and some seeds of the Queensland nut (*Macadamia ternifolia*) from Trinidad. At the Botanic and Experiment Station the plot experiments have consisted in trials with different green dressings including two species of indigo. The subject of green dressings is one of importance to planters.

As regards the notes published on economic plants at the Station, consideration is given first to Castilloa and Hevea rubber. Castilloa is again reported as unsuited for cultivation in Dominica. The results of examination of Hevea rubber in London have been favourable, and there is no doubt that certain districts of the island are naturally capable of producing good trees. In this section consideration is also given to the question of budding limes on hardy stocks. Practical success has been achieved in this matter and plants will soon be available for distribution. This question of budded limes is important in connexion with the prevalence of root disease in certain districts, since the root system of the hardy stock may be expected to offer greater resistance to infection than the more susceptible roots of the seedling limes.

Coming to the subject of diseases in particular, attention may be called to the useful report which appears by the Mycologist of this Department. In this the nature and methods of control of lime root diseases are adequately outlined

Progress in the chief industries receives attention on pages 17-22 of the report. The lime crop for 1914 was somewhat less than in 1913 but its value was £187,031, or £44,369 more than in the previous year. In view of the fact that high prices may not continue in future years, the importance of increasing the yield per acre is wisely insisted upon. This can be effected by manuring, by the avoidance of overcrowding, and by giving greater attention to the question of drainage. In a general way another cause of serious loss in the lime industry is the lack of co-ordination between the work in the field and in the factory. Greater all-round efficiency is required in the work of producing, handling and preparing the crop for market. It is urged especially that more care should be devoted to the preparation of concentrated juice of high quality.

During the year under review there was a relatively large output of raw lime juice due principally to Army and Navy requirements. The export of green limes to New York again constituted a record on past years.

In regard to the cacao crop, the shipments for 1914 again showed a reduction on those of the previous years, but the exports of coco-nuts increased. The number of nuts exported in 1914 was 554,549 compared with 391,044 in 1910. The minor products shipped from the colony included oranges, bay leaves and the oil of each, starches, coffee and hardwood. These are valued at about £3,000.

Efforts in connexion with general agricultural progress deal with technicalities in the manufacture of lime products. With the unusually high price reached by concentrated lime juice it became necessary during the year to reconsider the point of economical concentration. It is made evident that the planter who concentrated say 12 to 1 at ordinary times would stand to lose considerable sums of money if he continued to concentrate to the same degree when concentrated juice is selling at £40 or over per pipe. Following this information are notes on the feeding and manurial value of lime trees, which have already been published in the *Agricultural News*. In connexion with the preparation of lime products, it should be mentioned that the Agricultural Department is prepared to test lime juice for private individuals at a moderate charge. Though not taken advantage of to the fullest extent, planters are sending in more samples than they used to.

The main body of the publication concludes with an account of efforts to extend interest in agricultural matters, and with a section devoted to details of administration and meteorological returns.

Appended to the general report just reviewed are two others dealing, respectively, with manurial experiments and agricultural education in Dominica. The report on manurial experiments consists of two parts: that dealing with cacao, and that having reference to limes. The cacao experiments constitute a continuation of the scheme described in previous reports and again indicate the great value of manuring, especially with organic matter.

The second part dealing with manurial experiments conducted in limes is new. The creation in 1913 of a lime experiment station was a matter of very considerable importance: this station will be of great service in solving problems connected with the lime plant for which, hitherto, no proper facilities have existed in the Lesser Antilles. The results already attained are of much interest, but in view of the short time this Station has been in existence, they cannot be regarded as conclusive. The results indicate that in lime cultivation manuring is distinctly remunerative.

As in former years a satisfactory standard is being maintained with reference to agricultural education. The report on this subject has regard to the training of pupils at the Botanic and Experiment Stations. A large amount of useful field work is done by these pupils, and class teaching is done once a week, on Saturdays. A written examination for these pupils is conducted twice during the year by the Imperial Department of Agriculture. Educational efforts have also included instruction to small holders, which in the past have proved so successful. Encouragement is given at the Botanic Station to those who are in a position to take up the Courses of Reading and Examination in Practical Agriculture conducted annually by the Imperial Department. Several successful candidates have entered from Dominica in recent years and it is hoped that full advantage will be taken of this means of self-advancement in the future.

In conclusion it will be evident that the report under review contains a large amount of information of great interest and value to the planting community not only of Dominica but also of tropical colonies generally.

FUNGUS NOTES.

DISEASES OF CITRUS IN THE ISLE OF PINES.

We have received the First Annual Report, dated May 1915, of the Citrus Pathological Laboratory, San Pedro, Isle of Pines, published by the San Pedro Growers Company, Columbus, Ohio. The Isle of Pines is a dependency of Cuba, situated to the south of the western end of that island.

An introduction by Mr. F. S. Earle, formerly Director Estacion Agronomica de Cuba, supplies the information that the Growers Association have over 1,200 acres of citrus trees, mostly grape-fruit, at San Pedro. Planting was begun in the spring of 1909.

When the fruit began to be shipped there were very serious losses from decay in transit and in 1914 Mr. Earle was brought in to advise on this and other questions. He reports that the fruit was from young trees that had not received a properly balanced fruiting fertilizer (it is to be feared that a good many trees in the West Indies have to go through life without this luxury), that the picking and shipping were done during very wet weather, that no proper packing facilities were available, and that the fruit was subjected to much rough handling in transit. Without questioning the author's dictum that all these unfavourable factors combined would not cause the rotting of fruit except for the presence of some rot-producing organism, or his statement that until this organism or organisms had been definitely determined and critically studied any proposed remedial measures could only be empirical, it might well be asked whether the application of any amount of taxonomic and physiological research would prevent the fruit from rotting in one way or another under such circumstances.

A privately maintained pathological laboratory was established for the investigation of this and other troubles, with Mr. John M. Rogers as investigator under the direction of Mr. Earle. The results already achieved are regarded as amply justifying the expense involved.

The report includes notes on a number of insect pests and of various affections of trees and fruit. The longest article, on the subject of Diplodia diseases, has special interest as dealing with a condition which has also come under notice in Montserrat. The discussion of withertip is of interest for similar reasons.

The latter article throws some light on a question which has been something of a puzzle to the present reviewer. The literature of citrus diseases in America from 1904 onwards contains frequent references to *Colletotrichum gloeosporioides* as the cause of die-back of twigs of citrus trees, spotting of the leaves and fruit, and dropping of flowers and young fruit. But although a fungus apparently answering to the description of *Colletotrichum gloeosporioides* is universally distributed on dead twigs of lime trees in the Lesser Antilles, and has occasionally given evidence of ability to function as a weak parasite in such situations, no such damage to leaves and fruit as is described in America has been in evidence. Earle and Rogers now state with regard to *Colletotrichum gloeosporioides*: 'According to our observations and experiments here it is strictly a saprophyte, and has little or no power to attack living tissues. It is everywhere present in the groves, occurring abundantly on dead tissue of leaves, twigs and fruits, but in none of our inoculations has it been able to produce a specific disease.' The writers go on to say that the earlier authors seem to have confused the effects of this fungus with those of another Colletotrichum (of the lime) which is an active parasite. This species also occurs in the Isle of Pines on 'the native lime, causing damage to the leaves and serious blasting of the flowers and young twigs and the distortion and dropping of the fruits.' Apparently we have the first fungus but not the second in the Lesser Antilles: a position which every effort should be made to maintain. (It is not clear what plant is referred to as the 'native' lime. No species of Citrus is regarded as indigenous to the New World. Apparently the word is used in a sense equivalent to 'locally established'.)

The Diplodia disease to which an allusion is made above is caused by a fungus which the writers regard as their most serious citrus enemy. It attacks trunks, twigs and leaves, and causes the only destructive rot of the mature fruit. 'A dying back of the branches, especially on trees on unfavourable soils and at the beginning of the dry season, has long been known in Cuba and the Isle of Pines as a serious citrus trouble..... Our investigations show, very clearly, that it is caused by this Diplodia fungus, and we are therefore calling it Diplodia Die-back.' It 'does not attack actively growing tissues, but when growth suddenly stops from any cause, as from the setting in of a sharp period of drought, many twigs may become infected.' Fruit is attacked on the tree, and infects the twigs on which it is borne. The disease may be self-limited to one limb, or may in other circumstances kill the trunk itself.

In seeking to remedy the disease, beyond cutting out diseased limbs, chief reliance must be placed on such cultural methods as will keep the trees in a thrifty growing condition. Limbs weakened by scale are regarded as particularly subject to die-back, and the white scale (*Chionaspis*) by causing cracking of the bark often leads to infection.

The specific identity of the fungus has not been determined, but it has been found to be somewhat widely distributed on other tropical plants. One might suggest that a comparison be made with *Lasiodiplodia theobromae*, Griff. et Maubl., the member of the group most familiar in the islands further south, and a species to whose protean character the list of synonyms bears sufficiently eloquent witness.

W.N.

DIE-BACK OF LIME TREES IN MONTSERRAT.

As affording an interesting comparison with the description reviewed above of citrus branch troubles in the Isle of Pines, the following extract is published from a report made to the Imperial Commissioner of Agriculture respecting a recent short visit to Montserrat :—

'The factors concerned in the dying back of twigs and branches are possibly somewhat complicated, and cannot be determined with certainty by inspection and the examination of specimens. Observations of the sequence of events during their decline are necessary before a definite conclusion can be reached. Certain probabilities, however, may be indicated.

'Much of the die-back is complicated by the presence of scale insects on the branches which fail. I was able, however, to find instances where scale insects were practically absent and where there were no indications of their having been present in adequate numbers to account for the failure. I regard them in most cases as accessories merely, which hasten, but do not cause the death of twigs and branches. I am more inclined to believe that it is usually when the branch has already become sickly that they are able to increase to a serious extent.

'There are two fungi present on diseased branches at a sufficiently early stage and with so much regularity as to enable them to be regarded as possible parasites. The first of these is a species of Colletotrichum whose fructifications are found everywhere in the islands I have visited on dead or dying lime twigs. It closely resembles the withertip fungus of American writers on citrus diseases (*Colletotrichum gloeosporioides*) but has not been found to cause any such effects on leaves and fruits as are recorded for that fungus. A case has been seen on a young tree in Barbados which left little room for doubt that this fungus can under some circumstances bring about the death of twigs and small branches. I have not seen any indication of its presence on larger branches.

'On such diseased main branches as were examined in Montserrat, the fungus found working up to the margin of apparently healthy wood and fruiting on the dead bark is a Diplodia, which appears to be the same as the well-known cacao fungus. In the case of cacao it is associated with the die-back that occurs on trees in exposed situations, usually in circumstances which make it difficult to decide whether the die-back has attracted the fungus, or the fungus has caused the die-back. The general opinion, to which I myself adhere after a period of doubt, is that it acts as a parasite on trees weakened by unfavourable conditions. It may very well be found to have a similar position in respect of lime trees.'

W.N.

AGRICULTURE IN JAMAICA.

A good average crop of coffee was reaped during the year, but owing to the low prices the value of the exported coffee was only £166,000 or a reduction of £100,000 on the crop, as compared with values ruling in 1912, when we had a record year for this staple under modern conditions of competition.

Immediately after the outbreak of the war, coffee was almost unsaleable. There is now a good demand at very fair prices, our trouble being that of shipping facilities.

A record year has been established for cacao in the list of our exports. It is now evident that the Government were wise in giving especial encouragement to this industry. The 340,000 cacao plants distributed free to small holders during the past three years through the various nurseries, should serve to extend the industry to some practical purpose in the near future. The importance of sanitation in the established plantations is also receiving general recognition and unproductive trees have been brought into good bearing by simple field measures.

The cacao plots at Hope show marked improvement under the new management and a good crop was reaped.

The budding of 'Criollo' on Forastero seedlings has been found to be very disadvantageous as the former variety is far less fruitful and vigorous. A fine strain of Red Forastero seedlings has been secured from selected pods kindly supplied from Rose Hall estate by the Hon. Dugald Campbell for our purposes at the Hope Nursery.

A plantation of these seedlings showed a high average quality and some of the trees are of remarkable vigour and yield large crops of fine, large red pods.

The Microbiologist has done a good deal of research work on the diseases of cacao during the year and has made useful suggestions to planters with regard to the treatment of unhealthy trees.

The expectation of making a record of 20 million bunches of bananas exported in 1914 was defeated by the unfortunate drought during the middle of the year.

The output was therefore only 16¼ million stems, although this is fairly close to the previous maximum for this staple in our records of the exports of the Colony. The banana industry is at present depressed. Prices rule very low, the drought greatly reduced the size and quality of the early fruit and 1915 will be one of our lean years for the banana industry.

Its recovery, however, can be expected with confidence although war conditions may prolong the present depression.

(Annual Report on the Department of Agriculture, Jamaica, for the year ended March 31, 1915.)

THE RESULTS OF PLANTING SMOOTH COTTON SEED.

On page 308 of Volume XIII of this Journal the results were given of an analysis of a number of samples of Sea Island cotton seed in respect of the presence or absence of fuzziness on the seed coat. The prevalence of seeds quite free from fuzz was small in all cases. The maximum, reached only in St. Vincent samples, was 3 per cent., the remainder having only 1 per cent. or less.

The question having been raised whether the operation of sorting out these seeds for rejection as usually practised is a useful one, the smooth seeds obtained in the analysis mentioned above were forwarded by the Commissioner of Agriculture to Mr. F. R. Shepherd, Agricultural Superintendent in St. Kitts, with a request that plants be raised from them and examined.

Mr. Shepherd's report is now to hand. The plants were grown out of season and under difficulties arising from leaf-blister mite and cotton stainers. Seventeen survived to a stage which permitted of the picking of seed-cotton for examination to an amount of some 1 to 5 oz. per plant.

It was not possible to detect much difference in the individual plants, that is to say, none would have attracted attention as rogues in the field. All would have been picked in the ordinary course.

The following table gives the results of the examination made by Mr. Shepherd:—

Quality of lint.	No. of plants.	Percentage of smooth seed.
Long, strong, fine.	3	11, 7, 0
Short, weak, coarse.	13	100, 100, 100, 100, 90, 83, 80, 55, 50, 40, 11, 7, 5
Short, weak, fine.	1	7

Thus out of seventeen plants only three produced cotton with desirable qualities. It appears, therefore, that the policy of rejecting smooth seeds is a sound one.

The existence of plants with all their seeds smooth, and the varying proportions of smooth seeds in the remainder, suggest that a further analysis might give interesting results.

It is hoped to raise progeny rows from some of these plants for the purpose of testing the inheritance further.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, August 10, 1915.

ARROWROOT—2¼*d.* to 4¾*d.*
BALATA—Sheet 2*s.* 4½*d.*; block 1*s.* 10*d.*
BEESWAX—No quotations.
CACAO—Trinidad, 80/- to 83/- per cwt.; Grenada, 75/- to 80/-; Jamaica, no quotations.
COFFEE—Jamaica, no quotations.
COPRA—£23 10*s.* per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, no quotations.
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Jamaica, 55/- to 75/-.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 3/8 to 3/9; concentrated, £25; Otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations.
MACE—9*d.* to 2/11*d.*
NUTMEGS—4¼*d.* to 5¾*d.*
PIMENTO—No quotations.
RUBBER—Para, fine hard, 2/4¾; fine soft, 2/2¾; Castilloa, 2/2¼.
RUM—Jamaica, 2/5.

New York.—Messrs. GILLESPIE BROS. & Co., September 1, 1915.

CACAO—Caracas, 17c. to 17½c.; Grenada, 17¼c. to 17½c.; Trinidad, 17¼c. to 17½c.; Jamaica, 14½c. to 14¾c.
COCO-NUTS—Jamaica and Trinidad selects, $22·00 to $23·00; culls, $12·00 to $13·00.
COFFEE—Jamaica, 7¾c. to 11c. per ℔.
GINGER—13¼c. to 16c. per ℔.
GOAT SKINS—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 38c. to 40c. per ℔.
GRAPE FRUIT—Jamaica, $3·00 to $4·00.
LIMES.—$4·00 to $6·00.
MACE—47c. to 51c. per ℔.
NUTMEGS—11c. to 11½c.
ORANGES—Jamaica, $1·50 to $2·50.
PIMENTO—3⅛c. per ℔.
SUGAR—Centrifugals, 96°, 4·77c. to 4·83c.; Muscovados, 89°, 4·12c. to 4·18c,; Molasses, 89°, 3·99c. to 4·05c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., September 6, 1915.

CACAO—Venezuelan, $17·50 ; Trinidad, $17·00 to $17·50.
COCO-NUT OIL—78c. per Imperial gallon.
COFFEE—Venezuelan, 9c. to 11c. per ℔.
COPRA—$4·25 to $4·40 per 100 ℔.
DHAL—No quotations
ONIONS—$2·25 to $2·50 per 100 ℔.
PEAS, SPLIT—$11·50 per bag.
POTATOES—English $2·25 to $2·50 per 100 ℔.
RICE—Yellow, $5·80 to $6·25; White, $5·60 to $5·75 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. T. S. GARRAWAY & Co., September 6, 1915; Messrs. JAMES A. LYNCH & Co., Ltd., September 6, 1915.

ARROWROOT—$4·00 to $4·60 per 100 ℔.
CACAO—$14·50 per 100 ℔.
COCO-NUTS—$16·00.
HAY—$1·70 to $1·90 per 100 ℔.
MANURES—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia, $85·00 to $90·00 per ton.
MOLASSES—No quotations.
ONIONS—$3·00 to $4·00 per 190 ℔.
PEAS, SPLIT—Canada, $5·40 per 120 ℔.
POTATOES—Nova Scotia, $3·00 to $3·25 per 160 ℔.
RICE—Ballam, $6·00 to $6·10 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
SUGAR—American granulated, $6·00.

British Guiana.—Messrs. WIETING & RICHTER, August 21, 1915; Messrs. SANDBACH, PARKER & Co., September 17, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	$9·50
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	14c. to 15c. per ℔.	16c. per ℔.
CASSAVA—	$1·44	——
CASSAVA STARCH—	——	——
COCO-NUTS—	$10 to $15 per M.	$18 per M.
COFFEE—Creole	13c.	14c. per ℔.
Jamaica and Rio	14c. to 15c. per ℔.	14c.
Liberian	10c. per ℔.	10c. per ℔.
DHAL—	$8·00	——
Green Dhal	——	——
EDDOES—	$1·92	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	5c.
PEAS—Split	$12·00 to $12·50	$12·00 per bag. (210 ℔.)
Marseilles	——	5c. to 6c.
PLANTAINS—	20c. to 48c.	——
POTATOES—Nova Scotia	$2·75	$2·60
Lisbon	——	——
POTATOES--Sweet, B'bados	$2·16	——
RICE—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
TANNIAS—	$3·36	——
YAMS—White	——	——
Buck	$4·00	——
SUGAR—Dark crystals	$3·75 to $3·85	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

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Fortunately Situated.

CONSIDERABLE anxiety is being felt in many countries at the present time concerning the scarcity of potash manures, the supply of which is a German monopoly. Vigorous efforts have been made to develop certain potential sources such as may be found in varieties of felspar and in seaweeds, but it appears impossible to make good in this way the present deficiency, at least in a manner that will prove economical. A recent article by Dr. Russell of Rothamsted silently acknowledges this fact, for in it attention is confined to the courses that should be adopted in farming land without the usual potash manures. Two methods, says Dr. Russell, may be adopted: other sources of potash can be used instead of the Stassfurt salts; and secondly, the supplies of potash in the soil can be made available. 'Other sources' consist of the ashes of various plants together with animal manures. Great care, it is said, should be taken of liquid manure, a valuable source of potash which is often allowed to run to waste in normal times.

The second suggestion of making supplies in the soil available is new and important. It must be remembered that potash is not easily washed out of the soil; it is absorbed by various substances. Consequently if a soil has been well managed, considerable stores are to be found in it though much of it may be in slowly available form. Two agencies may be adopted to set free the mineral: sodium salts, especially salt and sodium sulphate may be added, or else lime or chalk may be applied. Neither lime nor salt actually supplies potash; their action is in the nature of a substitution process in which lime or soda takes the place of potash in the unavailable chemical compound. Possibly, however, in the case of many crops, the soda is directly useful to the plant and will fulfil some of the functions of potassium salts. Lime, however, cannot take the place of potash, and its effect is entirely indirect. The process as a whole is essentially one of liquidating capital, and if persisted in for many seasons might have bad effects; but, as Dr. Russell points out, as a war measure no harm need be anticipated. Some crops grown in England and other temperate countries require very large amounts of potash. The potato crop is an example. Unfortunately there are firmly rooted objections to the application of lime and salt to potato land, and it looks as if the world's potato crop of 156 million tons annually, is likely to suffer. It is certainly the largest, and perhaps the most important crop in the world.

We are more fortunately situated in the West Indies with regard to potash and there is little cause for anxiety or alarm. The results of soil investigations clearly indicate that we have large reserves and that each year the necessary quantity is naturally rendered available. To convince the reader on this point, some reference may be made to specific experiments. In regard to British Guiana, Professor Harrison* in a recent review of manurial experiments with sugar-cane says: 'The addition of potash when applied either as sulphate of potash or as nitrate has exerted little if any effect. The normal weathering of the constituents of the soil sets free for each crop potash in excess of the quantity necessary for the requirements of the plants. This holds good under ordinary conditions of cultivation where the greater proportion of the potash taken up by the plants is directly returned to the soil; but where the canes and cane tops are removed from the land, as in nurseries for the supply of cane plants, it is probable that partial potash-exhaustion will take place in the course of a few crops.'

Again, Dr. Tempany† in his study of the manurial experiments with cacao conducted in Dominica during eleven years comes to the following conclusion: 'On the whole, the results cause one to incline to the view that when adequate dressings of nitrogen are applied combined with considerable amounts of organic matter, the natural reserves of potash and phosphate present in the soil are for the present sufficient in quantity, and are liberated with sufficient rapidity to meet the demands of the crop in these respects.'

Further evidence of a like nature is available as the result of investigations conducted over a series of years by Dr. Francis Watts.‡ In his study of the soils of Montserrat available potash was always found to be present in considerable, and sometimes in large amounts. The same results were obtained from a chemical examination of the soils of Nevis. In fact West Indian volcanic soils are characterized by a high potash content, while the amount of phosphate present is generally low.

As already observed, the West Indies are fortunately situated in this respect. It would have been another matter if it were a question of a deficient supply of nitrogen. But that, of course, would have had far-reaching effects militating against the successful conduct of the war, and the West Indian aspect, urgent in its way, would no doubt have been lost sight of on account of its comparative unimportance.

A correspondent to the *West India Committee Circular* for September 7, which has been received as we go to press, puts forward views on the subject of potash which harmonize with those that are given above. While justly calling attention to the importance of carefully utilizing by-products in the West Indies that may contain, like the ash from burnt megass, considerable potash, the writer anticipates no harm as a result of the present shortage of artificial fertilizer. He concludes: 'The present situation tends to the thought that if our agriculturists are careful to re-utilize every ounce of potash of the crops, which they can do, with the exception of that which is shipped in the form of the ultimate product, and at the same time compensate for unavoidable waste of available potash in the way of drainage, etc., by the judicious growth of green crops, there would be little need for potash manures. There are very few soils which do not contain enough potash in some form for a very long period of cultivation, and the amount of potash required to be added should be very small. There is too great a tendency in modern agriculture to draw from the outside for plant food rather than to look to the soil to give it. The present potash famine may, therefore, be of very great service to agriculture by compelling the cultivator to bring up his plants on nutriment from the soil, instead of by the feeding-bottle method of modern manuring.'

SUGAR INDUSTRY.

REMOVAL OF SUGAR DUTIES IN U.S.A.

The *Louisiana Planter* for September 4, 1915, discusses in an interesting manner the aid proposed to be given by the United States Government to the cotton industry in contradistinction to the proposal to remove entirely as from May 1916 the duties on sugars in the United States imported from other countries. It is mentioned that the Secretary of the Treasury of the United States has recently announced that he was prepared to advance 30 millions of dollars in order to 'take care of cotton'. He proposes to place 30 millions of dollars in gold in the Federal Reserve Banks of Richmond, Atlanta and Dallas for the purpose of rediscounting loans made on cotton, secured by warehouse receipts by member banks. If it should be found more expedient, he will place the funds in certain national banks. He will exact no interest for the deposit in reserve, and practically imposes a 6 per cent. limit on loans made by member banks to their customers, based on cotton warehouse receipts. It is pointed out that in doing this the Government takes practically no risk whatever, and gives a degree of support to the market far in excess of the limited amount of money that is proposed to be loaned.

It is recalled that some few years ago the Brazilian Government, following on the initiative of the chief coffee-producing State, Sao Paulo, endeavoured to 'take care' of

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* *West Indian Bulletin* Vol. XIII, p. 174.
† *Ibid*, Vol. XIV, p. 98.
‡ *West Indian Bulletin*, Vol. VI, pp. 263-84.
Ibid, Vol X, pp 60-82.

coffee. It is now found that the Brazilian Congress has voted to again valorize coffee, and to issue in Brazilian currency an amount equal to 37 millions of dollars as a loan to the State of Sao Paulo for advances to planters, one of the conditions of the law being that the exports to Europe shall not exceed 6 millions of bags altogether. These advances are intended to protect Brazilian coffee against the loss of Germany as a consumer of coffee.

The former venture of this kind having been calamitous in the end, there seems to have been considerable opposition in the Brazilian Congress to this present move: but the opposition has weakened and the agreement to advance to the State of Sao Paulo as above mentioned will go into effect. In making the loans, the State of Sao Paulo will exact warehouse receipts for the coffee and thus make itself practically safe in any advances that it may make to the coffee planters.

It is thus seen what the United States is now endeavouring to do to protect the great cotton interest of that country. It is also seen what the republic of Brazil is endeavouring to do to protect its coffee industry, which is the most conspicuous export industry of that country.

Contrasting the action of these two great nations in supporting these two great industries with what the United States determines to do with the sugar industry as indicated above, the *Louisiana Planter* gives somewhat interesting data in regard to this latter industry. The sugar industry of Louisiana reaches normally about 300,000 long tons of sugar. The beet sugar industry of the United States reaches normally about 500,000 long tons of sugar. The domestic sugar industry of the United States, within the limits of the States reaches thus some 800,000 tons. The island of Porto Rico produces over 300,000 tons of sugar and the Hawaiian Islands over 500,000 tons. The sugars of Porto Rico and Hawaii, as territories of the United States, enter this country free. Within the limits of the United States, Louisiana in cane sugar and the North-western States in beet sugar produce 800,000, thus giving 1,600,000 tons of free sugar produced at home, so to speak. About 300,000 tons are produced in the Philippines, and under the law 350,000 tons of Philippine sugar may be imported into the United States free of duty. It is now proposed, as mentioned already, that on the first day of May 1916, the duties on sugars in the United States imported from other countries shall be entirely removed. The assumption is made that the removal of the duties will not extinguish the sugar industry of Hawaii or of Porto Rico, as the industry may survive in those tropical countries; but within the United States proper the 800,000 tons that are now produced, valued at nearly 100 millions of dollars, represent to-day the last production of sugar of any importance within the iimits of the United States, the policy of the present administration thus leading to the direct destruction of this great industry. The situation, therefore, may be summarized thusly: that while the United States itself is now endeavouring to 'care for' the cotton crop by United States aid, and while the Brazilian government, with ample experience in its special way of aiding its coffee industry, has now agreed to repeat the efforts which were so successful some years ago in holding up the coffee market, we find the sugar producers of the United States placed in peril, and with a practical certainty of the extinction of their industry, in order to conform to a political policy that is seemingly at variance with the policy of any nation that desires to protect itself against destructive competition with any of its neighbours. Finally, the question is asked why sugar should be singled out for destruction, and cotton aided when it is in great peril; and the hope is expressed that Congress when it meets in December next, will consider the whole matter and conclude to 'take care of' sugar in the United States as well as to 'take care of' cotton. What effect this proposed removal of duties will have on sugar production in the British West Indies is problematical.

HOW TO AVOID ERRORS IN FIELD TRIALS WITH SUGAR-CANE.

When the Leeward Islands sugar-cane experiments were re-organized in 1889 there was considerable discussion as to the best method of planting and sampling, in order to avoid as far as possible the errors incidental to such work. It was decided that for variety trials the single-row method promised many advantages, and accordingly the canes were planted in rows running across the field, and each row was regarded as a separate plot. In the case of manurial experiments, such an arrangement was seen to be impracticable, since the effects of the fertilizers applied to one row would be felt by those on either side. Accordingly in these the rectangular plot was employed.

Concerning the number and size of the plots that should be employed in conducting manurial experiments, we have to consider two principal factors: (a) soil irregularities, and (b) seasonal variations. In the West Indies, Professor Harrison, Director of Science and Agriculture, British Guiana, has given this subject considerable attention. Small plots ($\frac{1}{10}$ to $\frac{1}{40}$-acre) are considered most suitable, but these must be duplicated several times, in order that the mean results may be reliable. In a general way it may be stated that the means of nine plots of small areas in any one year are reliable for the study of the effects of manures. From this it should not be inferred that single plot experiments are valueless. In cases where the effect of the manure is pronounced, as in the case of nitrate of soda on ratoon canes, single plots are quite sufficient to indicate approximately the increase obtained.

The question of sampling is perhaps the most difficult of all the matters concerning sugar-cane experiments. It has received very careful attention in India, and the following conclusions arrived at by Mr. H. E. Annett, B.Sc., in Bulletin No. 49 of the Agricultural Research Institute, Pusa, will afford a fitting ending to this article. The sugar-canes to which the following conclusions have reference were grown in duplicate plots $\frac{1}{10}$-acre in area:—

'The results of the experiments confirm those of Mr. Leather in that in sampling a field of sugar-cane the following method gives very accurate results. The sample should consist of about 200 canes taken in groups of three from about seventy places throughout the area. These seventy places should be accurately measured out and the three canes nearest to the measured points be taken, provided such canes are canes which would normally be taken by the cultivator for juice extraction.

'No increase in accuracy seems to be obtained by taking half plot samples.

'In these experiments the "100 canes" samples seem to have given as good results as any other method of sampling, but samples consisting of only fifty canes are much less reliable.

'Data have been obtained bearing on the experimental error which must be allowed for in field experiments with sugar-cane in a series of plots. The results naturally only strictly apply to experiments on the laterite soil of which the Dacca Farm soil is a type. This soil shows much more than the usual lack of uniformity.'

CO-OPERATION.

CO-OPERATIVE INSURANCE IN WEST INDIAN AGRICULTURE.

In connexion with our review of the work of the Antigua Onion Growers' Association which appears on this page, attention may be called to a paper on another aspect of co-operation, namely insurance, which was read recently by Dr. Tempany before the Antigua Agricultural and Commercial Society.

After sketching in outline the growth and importance of general co-operative methods, not only in Europe but also in the West Indies, Dr. Tempany proceeded to discuss the special subject of insurance. The object to be attained is to provide against losses in respect of any particular risk by means of payment at an annual percentage rate on the value of the article to be insured, which slightly exceeds the average rate of loss in this respect. An example of co-operative insurance is found in the case of the co-operative cattle insurance societies which have grown up very largely throughout European countries. In these it is customary for a number of societies to group themselves together to form a reinsurance association, which provides against any of the contributing societies losing unduly heavily in any one year. The advantage of this form of insurance in relation to stock is that members can observe and supervise the care given to insured animals, and the action taken when anything occurs. They are also in a position to estimate collectively the value of the animals, both upon insurance and in case of loss. In some countries cattle insurance is State aided, and in some it is compulsory. In others the State organizes the insurance by establishing institutions or federations formed of the local mutual societies, which adopt the model articles approved by the institution to which they are attached. A proportion of the premium received by the local societies is paid to the central society, which bears the same proportion of the indemnities.

Premiums have to be fixed in accordance with the risks involved and experience gained. In some countries the rate of premium is fixed every five years, based on the results obtained. Also, in certain instances, compensation is not paid for animals lost from epidemic disease, and in others certain diseases are excluded. Seldom are very young or very old stock accepted.

In order to make certain that the owner will tend a sick animal properly and not let it die so as to obtain the insurance money, societies never pay the whole value, but a proportion varying from 60 to 70 per cent. It is usual to fix a maximum value for which an animal may be insured; the owner states the value and this valuation is checked by the committee, whose valuation holds good. Valuations are checked every six months and altered if necessary.

In mutual insurance societies, the officials give their service gratuitously, but the secretary may receive a small salary. Every member joins for a year, and after receiving an indemnity he must continue his membership for three years. In all cases a reserve fund is accumulated out of the balance left after paying indemnities. Societies are always limited in liabilities and therefore not responsible beyond their resources. If funds do not suffice a proportionate reduction in the indemnities is made all round.

In the West Indian islands it would appear that there is a very definite opening for the establishment of such cattle insurance societies provided that equitable arrangement can be entered into between the contracting planters. Another matter that appeals as a fit subject for co-operative action is the insurance of cane fields and estate buildings against the risk of fire.

As a basis for discussion Dr. Tempany has drafted a set of rules which may perhaps be regarded as suitable to local conditions. Subsequent efforts in connexion with this idea of co-operative insurance in Antigua will be awaited with interest.

ANTIGUA ONION GROWERS' ASSOCIATION: REPORT FOR 1914-15.

The Board of Management of the Antigua Onion Growers' Association have just issued their report on the results of last season's work. The results are very encouraging and should pave the way for extended effort in future years. Indirectly the work of such an Association as the one under consideration is valuable by reason of the impetus which it will give to West Indian co-operative efforts in general.

During the year under review a very important advance was shown on previous ones. As the result of the operations of the previous season, a scheme was adopted whereby the onion crops of members should be marketed on a co-operative basis through the Association, a first payment of 1c. per lb. being made on delivery followed by a distribution of the surplus profit, *pro rata*, among members according to the amounts delivered by them. In all twenty-five estates united to dispose of their produce in the manner indicated. The total gross weight of onions purchased was 186,198 lb.; this was graded, cured and packed and shipped by the Association, all necessary expenses including cost of crates being borne by that body. As the result of the season's work, it has been found possible to pay a bonus of 2*s.* 1¾*d.* per 100 lb. of onions delivered in addition to the first payment at the rate of 4*s.* 2*d.* per 100 lb. made on delivery.

During the season 1913-14, the total weight of onions purchased was 42,799 lb., so that the operations on the present occasion are more than four times the size of those in the preceding year.

To permit of the work being carried on on such an extended scale it was found necessary to provide for increased accommodation. This was effected by a sanction from the Government which allowed the Association to occupy the remainder of the building formerly utilized by the Antigua Cotton Factory. The Government furthermore assisted the scheme by providing an advance for the purpose of equiping the factory.

In relation to the first payment for onions at the agreed rate of 1c. per lb., it was found necessary in order to finance the Association, to obtain a further advance from a firm of merchants locally, while the unexpended portion of the advance made by the Government to the Association on account of equipment and erection was also expended in this way. The total sum of money expended in the redemption of these advances with the necessary interest was £210 3*s.* 3*d.* As regards working expenses, the charge for crates and nails constituted the heaviest item, the expenses in this connexion amounting to £147 0*s.* 6*d.*

The total sum of money, after paying all expenses, available to be distributed as a bonus among members amounted to £200 12*s.*, which amount has been distributed at the rate of 2*s.* 1¾*d.* per 100 lb. as stated above. In accordance with the terms of the original memorandum 3 per cent. of the net proceeds has been placed to the credit of the Association and used to form the nucleus of a reserve fund for subsequent years. To the credit of the reserve fund have also been placed the subscriptions of members and

the proceeds of the sale of some surplus mesh wire left over after equipment was completed.

It is of interest to note that close agreement exists between the actual financial results of last season and those estimated.

As regards the shipment of the produce, the total number of crates exported was 3,320. The following are the markets to which shipments were made: Trinidad, Barbados, St. Lucia, Grenada, New York, Halifax, St. John. It was found that the months of February and March were by far the most remunerative for sale in the New York market. Whereas the New York market was found highly satisfactory, the same is not said concerning the Canadian market, one complaint being that the Association was not forwarded the proceeds of sale for a very long time. On the other hand, it is pointed out that shipments to Canada were made at a later date than those to other points.

In regard to the island markets, the results were, on the whole, satisfactory, but marketing the onions, especially in the smaller West Indian islands, entails a great deal more trouble and requires more forethought than does the larger market of New York. The system of fortnightly cables regarding the onion market in Trinidad and Barbados has been maintained and acknowledgement is due to the Association's representatives in those two colonies for the assistance they have rendered.

Notwithstanding this, however, on more than one occasion the Association was a loser by onions being shipped to Barbados by producers outside the Association, and to firms other than the Association's representatives. The results were seen in the two lots of onions being marketed one against the other to the detriment of both the Association and the outside shippers.

In relation to details of working, the entire season lasted for ten weeks, namely from February 15 to April 24. The average number of hands employed including two overseers was twenty-eight, and the maximum thirty-nine. Each week details of working were laid before and considered by the Executive Committee.

The report concludes with a statement of appreciation in regard to the part played by the Agricultural Department during the year's work. The secretarial duties and the supervision of financial arrangements were performed by Dr. Tempany, Superintendent of Agriculture for the Leeward Islands, while the actual work of the onion house was carried out under the constant supervision and attention of Mr. Jackson, Curator of the Botanic Station. The report states that both Dr. Tempany and Mr. Jackson maintained the closest touch with the whole of the details of the work, and that it is desired to place on record that without their assistance it would not have been possible to carry the season's work through to a successful conclusion. Reference is made also to the useful nature of the pamphlet entitled Onion Cultivation recently prepared by Mr. Jackson and published by the Imperial Department of Agriculture for the West Indies.

At the end of the report a summary is given of the advantages which accrue from participating in the work of the Association: (1) planters are in the first place assured of receiving on all occasions and without delay a price which will permit of the produce being grown at a reasonable margin of profit; (2) planters are freed from any anxiety or responsibility in regard to marketing matters; (3) the central packing and exporting establishment secures a much higher level of quality for the produce exported; (4) the organization facilitates the collection of information relative to market prices, and the standardization of the industry enables contracts and orders to be obtained and filled to much greater advantage than heretofore.

TOMATOES AND MANURE.

A note on acclimatizing the tomato in the tropics was given in the last issue of this Journal. The following, taken from the same source as the first (*Philippine Agriculturist and Forester*, June 1915), concerns manuring experiments with this plant:—

Nitrogen is required by the tomato for the formation of leaves and stems. Enough of this element must be present in order that a sufficiently strong stem may be formed to support the large fruits, and that the foliage may develop to such an extent as to enable the plant to carry on its normal functions of life without check. Too much nitrogen, however, is not advisable, due to its tendency to encourage excessive growth of vine at the expense of fruit.

Phosphorus is necessary mainly for the production of seeds, and is also an important constituent of the cell protoplasm.

Potash is present in all parts of the plant. It has an important rôle in plant assimilation, and is the principal component of protoplasm. It is essential to the formation of the acid in the tomato fruits, and its existence in abundant quantity in the soil is essential to success in tomato culture.

Carabao dung [equivalent to cattle manure] is the most satisfactory of all fertilizers used, from many standpoints.

It nearly doubles the total yield of the tomatoes, increases the yield in marketable fruits, and compares favourably with the more expensive forms of commercial fertilizers in hastening the maturity of the fruits.

It has the property of holding moisture in the soil. This may be taken as one of the reasons for the success with carabao dung in fertilizing the tomato, which is to some extent a plant of the dry season.

There is no danger in overdosing the plants by its use; in fact, the greater the application, the better the result is likely to be.

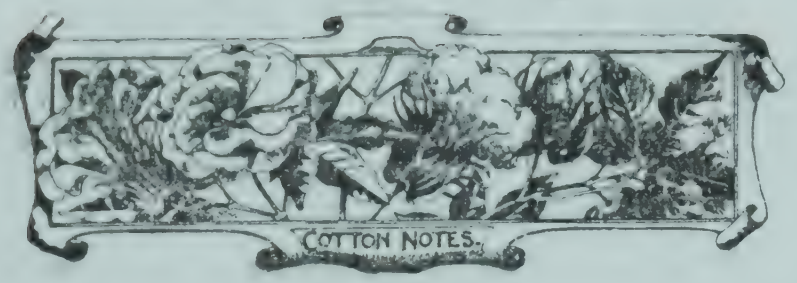
Carabao dung is commonly allowed to go to waste in this country and therefore can be had for practically nothing.

Many forms of commercial salts are unsatisfactory, and even dangerous, for use as fertilizers with the tomato plant. The tomato being a plant for the dry season, overdosing the plants will be disastrous; and it is hard to determine in an excessively dry season just what quantity will be safe. The danger may be minimized by making use of a generous supply of irrigation water; but a too abundant supply of water is just as fatal to the tomato plant (see experiment on irrigation). It will, therefore, be advisable to use commercial salts sparingly as fertilizers. The deficiency of plant food in the soil may in the case of the tomato be supplied with organic manures.

Liming is beneficial to the tomato; it increases the yield, both total and marketable, being second only to carabao dung in influencing the plants to yield a bigger crop. It also compares quite favourably with other fertilizers in hastening the maturity of the fruits. The only possible objection to its use is that it appears to have a tendency to decrease the size of the fruits. Its use should not be continuous on the same ground.

The fertilizers that have a tendency to hasten the maturity of the fruits are: Chloride of potash, alone, or in combination with nitrate of soda; carabao dung, and lime.

Chloride of potash, in combination with single superphosphate, increases the growth of the tomato plants more than does any other fertilizer or combination of fertilizers.



COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under dates September 4 and 20, 1915, respectively, with reference to the sales of West Indian Sea Island cotton:—

Since our last report a better demand has sprung up for West Indian Sea Island cotton, and between 400 and 500 bales have been sold at firm prices. The sales include Virgin Islands at 13*d.*, Nevis 15*d.* to 15½*d.*, Anguilla 15*d.*, Antigua 15½*d.*, St. Kitts 15*d.* to 16*d.*, Montserrat 14½*d.* to 15*d.*, and Barbados 15*d.* to 16*d.*

There is an unwillingness to pay more than 15*d.*, as the enquiry for yarn made from the better cotton is still very limited.

Since our last report [September 4] an extensive business has been done in West Indian Sea Island cotton at steady prices. The sales include Nevis 14*d.* to 14¼*d.*, Antigua 14*d.* to 14½*d.*, Montserrat 14*d.* to 15*d.*, Anguilla 14*d.*, Barbadoes 14½*d.*, St. Martin 14*d.*, and some inferior St. Kitts at 14*d.*; also stains 7½*d.* to 7 $\frac{13}{16}$*d.*

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending September 11, is as follows:—

As there has been received so far only 1 bag of new crop, and the crop will not commence to be marketed until the end of the month or early in October, there is nothing of interest as yet to advise.

The stock on hand of 130 bales consists of Planters' crops brought over from last season and held above the views of buyers.

COTTON EXPORTS FROM THE WEST INDIES.

The following table gives the quantity and estimated value of Sea Island cotton exported from the West Indies for the quarter ended June 30, 1915:—

Colony.	Quantity.	Estimated value.
Barbados	117,654	6,373
St. Vincent.	150,851	9,612
Antigua	24,250	1,314
Montserrat	32,081	2,272
St. Kitts	82,000	5,125
Nevis	42,573	2,661
Anguilla	19,000	1,188
Virgin Islands	15,296	765
Jamaica	nil.	
	483,705	29,310

Besides the above Sea Island cotton, there was exported from Grenada 190,362 lb., from St. Vincent 11,522 lb., and from the Virgin Islands 2,371 lb. Marie Galante cotton, of the estimated value of £3,966, £318, and £79 respectively.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

TRINIDAD. We notice in the minutes of a recent meeting of the Board of Agriculture, that Mr. C. Forbes Todd, formerly Manager of Molineux estate in St. Kitts and now Field Superintendent to the St. Madelaine Estates, Trinidad, has been appointed a member of the Trinidad Board of Agriculture.

The *Port-of-Spain Gazette*, in a recent issue, gives attention to Mr. Glaudon's pioneering work with silkworms at St. Joseph. Mr. Glaudon started to take an interest in the raising of silkworms many years ago and now possesses the white mulberry silkworm, the yellow mulberry silkworm, from Milan, the pure white eri worm, and the greyish-white eri worms. In 1908 while rearing the native silkworm (*Attacus hesperus*) the idea came to him to introduce the mulberry silkworm. He succeeded in rearing the mulberry worm as a polyvoltine race instead of the univoltine race as in France. The pure white eri worm was obtained from Mr. Watson, an Entomologist at Manchester, to whom Mr. Glaudon was referred by Professor Maxwell-Lefroy. The above is of interest in connexion with efforts that have been made to establish a silkworm industry in other islands.

The *Mirror* for September 17 calls attention to the fact that the local Government, acting on instructions from the Home Government, has prohibited the exportation of asphalt from this Colony to Holland. About 100 tons of this material which has been awaiting the arrival of the next Dutch steamer to be shipped to Amsterdam has therefore been detained.

GRENADA. Like Dominica and St. Lucia, this colony under the Plant Protection Ordinance, has prohibited the importation of all citrus plants, citrus cuttings and citrus budwood from the United States owing to the prevalence of citrus canker in that country.

ST. VINCENT. The attention of planters is directed by the St. Vincent *Sentry* to the Government notice stating that the machinery and appliances for shelling and kiln-drying corn are now ready for use at the factory at Richmond Hill. It is hoped the community will take full advantage of this facility afforded by the Government for promoting another minor industry.

The Anderson oil-expeller has satisfactorily dealt with the Government stock of cotton seed and is now taking seed from outside planters. The oil produced was somewhat dark in colour on account of the fact that most of the seed was not in good condition.

ST. LUCIA. A fresh supply of the following varieties of peanuts is now available at Réunion for immediate sowing, Gambia, Virginia Running, Virginia Bunch, and Refusque. These may be purchased at 2*d.* per package at the Castries Gardens and at the Agricultural and Botanic Station, Choiseul. A leaflet giving full instructions as to the cultivation of the peanut is enclosed in each package. Another notice which has been issued by Mr. Brooks, the Agricultural Superintendent is to the effect that from Monday, August 16, and until further notice, lime plants will be sold from the Government nurseries at 1*s.* per 100, freight free: 30,000 plants are now available.

DOMINICA. Mr. Joseph Jones, the Agricultural Superintendent, has written to say that very heavy weather was again experienced on September 22, the Gardens were again littered with broken branches, and a few Caryota palms which were loosened in the ground during the first gale were uprooted.

The trunk of a large specimen of *Washingtonia filifera* was snapped in two, which shows the force of the wind. A few small trees were blown over and a very large Saman tree at Morne Bruce was uprooted. Over 5 inches of rain fell during the day, which caused even more damage in the Botanic Garden than the wind. The lower portion of the ground near the cemetery was again flooded and is likely to remain so for several days. The water broke through the mulched cacao plot for the second time and swept away a portion of the mulch and the rich surface soil. This will have to be taken into account when considering the results of next season's manurial experiments. The loss of crops on estates exposed to the two gales is not inconsiderable. Several planters estimate the loss at from one-ninth to one-tenth the crop. Mr. Jones states that he considers this estimate a safe one.

A *Gazette* Extraordinary was published during September containing an Order-in-Council prohibiting the importation of cattle or other animals from Grenada, consequent on the contagious disease, known as anthrax, having broken out in that island. A similar prohibition was made in February with regard to the colony of British Guiana. Legislation is being considered with a view to the protection of certain birds, notably Ramier and Perdrix during the proper months of the year. There appears to be urgent need for protecting these birds on account of the clearing of forest areas for new plantations reducing the areas where they are unmolested.

ANTIGUA. The annual report on the Central Prison of the Leeward Islands shows that the greatest number of offences for which prisoners were committed during the year were for stealing sugar-canes and other growing crops. Praedial larceny in Antigua, as in other islands, has still to be efficiently dealt with. A report on education in the Leeward Islands makes an interesting reference to gardens in the elementary schools. The inspector states that in St. Kitts and Nevis the gardens were worked throughout the year, and he is of opinion that the teachers should receive the grants which their work deserves. He has therefore asked that the vote for agricultural instruction to primary schools which lapsed on March 31 might be revoted in St. Kitts-Nevis. The amount has now been revoted and the grants paid accordingly. It is hoped that school gardening will be taken up more energetically in all the Presidencies than it is at present.

Dr. Tempany writes to say that the Government Granary is now in full swing again with a large stock of corn to keep it busy for a month or so.

NEVIS. The recent storm occasioned some damage to cotton in exposed situations, but Mr. W. I. Howell hopes that a fair crop may be reaped. The sugar-cane crop is promising.

VIRGIN ISLANDS. In contrast to the wet and stormy weather experienced in other parts of the Leeward Islands, this Presidency encountered very dry and hot weather during the past month. This greatly arrested all agricultural activities. Progress still continues to be made in the matter of coco-nut demonstration and preparation for a third plot is being carried on. Attention was given at the time of writing to the preparation of the plots selected for the onion nurseries. Mr. Gomes, acting Curator, reports that the cotton crop is very backward on account of the dry weather and for the same reason the lime crop is a very small one. On the whole, the outlook of the Presidency was far from satisfactory but has no doubt improved with different weather conditions prevailing since the dispatch of the above report.

JAMAICA. According to a note in a recent issue of the Trinidad *Mirror*, it appears that the United Fruit Company have experienced great losses as the result of the storm on August 26. It is expected that the Company's output next year will be reduced by 30 per cent. The Company lost twelve lighters besides others damaged, and it is expected that they will have a big bill to meet as the result of damaged inflicted in other directions. This agrees with a report published in *The Times* in regard to the effects of the hurricane in general. This says in most places from 80 to 90 per cent. of the bananas have been blown down, and it is estimated that the export of bananas will be very small for the next nine months. Coco-nuts and cacao have only suffered trifling damage. According to an exchange, a report from Jamaica states that English capitalists are co-operating with Jamaica land-owners to revive the sugar industry on a large scale. The newspapers are enthusiastic on the subject, and the possibility of a keener demand in the future for colonial cane sugar has no doubt given additional impetus to the movement.

ROSES SUITABLE FOR CULTIVATION IN THE WEST INDIES.

Owing to the frequent enquiries made as to the best varieties of roses suitable for general cultivation in St. Lucia, the Agricultural Superintendent of that colony published the following list in the Report on the Agricultural Department for 1914-15:—

Name.	Colour.
Paul Neyron	Shell pink.
La France	Clear ,,
Rhea Reid	Deep Crimson.
Mde. Caroline Testout	Bright pink.
Meteor	Dark Crimson.
Sunrise	Yellowish red.
Safrana	Apricot.
Sunset	Golden sunset.
Marechal Niel	Yellow.
Wm. R. Smith	Flesh pink.
White Maman Cochet	White
Pink ,, ,,	Pink.
Radiance	Rosy carmine.
Marie Van Houtte	Straw yellow.
Madison	Flesh pink.
Mrs. Aaron Ward	Indian yellow.
K. A. Victoria	White.
Clara Watson	Salmon pink.
Killarney	White or Red.
Etoile de Lyons	Sulphur yellow.
Catherine Mermet	Rosy pink.
Etoile de France	Velvety crimson.
Helen Gould	Watermelon red.
Helen Good	Yellow to pink.
Lady Hillingdon	Golden yellow.
Antoine Rivoire	Flesh on yellow ground.
Robin Hood	Scarlet.
Papa Gontier	Rosy crimson.

The success of rose cultivation in the West Indies depends to a large extent upon the kinds of varieties chosen. Only Teas, Noisettes, and Bourbons should be selected.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents, and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this issue deals with the position of the West Indies in relation to the potash famine.

A useful note on how to avoid errors in field trials with sugar-cane will be found on page 322.

Considerable space is devoted in this issue on pages 324 and 325, to information concerning co-operative movements in the West Indies.

Insect Notes comprise an article on the acrobat ant which may possibly become a pest of cacao in Grenada. Under Plant Diseases will be found an important article on the effects of exposure on lime trees.

Concerning Agricultural Industries in Demerara.

The Mail edition of the Demerara *Daily Argosy* (September 18, 1915) contains several items of interest affecting the agricultural industries of that colony. Amongst these is the publication of a joint report by the Director and Assistant Director of Science and Agriculture covering reports from the Imperial Institute on the cottons produced by experiments carried out by the Department of Science and Agriculture in the cultivation of Sea Island cotton in the colony. The numerous experiments made since 1902 with regard to the cultivation of Sea Island cotton having demonstrated that this variety could not be successfully cultivated, efforts were directed towards raising hybrids between the Sea Island and the native Buck cotton, the object being to combine the vigour and perennial habit of the latter with the quality of the lint of the former. This object has now been attained, as is shown by the report from the Imperial Institute wherein the following passage occurs: 'It is satisfactory to observe that the aim of obtaining a Buck × Sea Island hybrid yielding a cotton of long staple has been achieved.' The brokers' valuation of the lint from the different hybrid cottons varied from 11*d.* to 14*d.* per ℔. with the best Barbados Sea Island at 14½*d.* per ℔.

Another item of interest concerns the outlook for the rice crop. The plantings this year are said to be so extensive as to give promise of a record crop; but the rice cultivation throughout the entire colony is suffering from the effects of drought. The period is regarded as a critical one; for at a time when the price of imported foodstuffs is high and when so much depends upon an abundant rice crop, it would be a misfortune if there were to be any serious failure of production consequent on drought. At the time of writing (October 4) the weather conditions, we hear, have not yet improved.

The occurrence of a fungus disease attacking the leaves and stems of Para rubber trees is also mentioned. This was first observed in 1913 in two of the larger cultivations in the colony. It has now been recorded from all three counties—Demerara, Essequebo and Berbice; but as far as is known, rubber growing on the coastland is free from it. The fungus organism which causes the disease is said to be *Passalora Heveae*. Spraying the plants thoroughly with Bordeaux mixture twice at an interval of one month, the collection and destruction of fallen leaves, and (in cases where 'die-back' occurs) the removal of the dead branches, are the remedies recommended.

In connexion with the cane sugar industry of the colony it is stated in the same journal that a new departure will be introduced on January 1 next when Mr. J. R. Bovell, head of the Agricultural Department of Barbados, will take up an appointment as agricultural expert to Messrs. Curtis, Campbell & Co. To this end Mr. Bovell, who, it is said, will relinquish his appointment under the Government of Barbados as at December 31 next, arrived in the colony early in September with the object of visiting the estates owned by his prospective employers. Messrs. Curtis, Campbell & Co. are also expecting the

rrival of a sugar chemist (Mr. W. McMillan) who is nder engagement to work on their East Coast estates. Mr. McMillan is said to have been previously engaged n Cuba.

The Gardens of the Royal Horticultural Society.

Situated at Wisley, in Surrey, are the Gardens of he Royal Horticultural Society, much of whose work s familiar to English horticulturists. Changes however, re in contemplation. The principal function of the tation in the past has been that of a testing ground or new species and varieties of fruits and vegetables vith a view to their introduction into general cultiva- ion, also as a training ground for men of the gardener lass. In the past a considerable amount of field ntomology and mycology has also been carried out. Arrangements have now been made (though their xecution has been interfered with by the war,) to nake the educational and research work wider and nore academic. It is intended to institute a degree ourse in horticulture in co-operation with the Imperial College of Science and University of London. During he summer the students will engage themselves in ratical gardening work, and in the study of physiology nd pathology in the field. During the winter, lectures nd demonstrations wlll be given at South Kensington. Wisley is equipped with a small entomological and small mycological laboratory, also experimental glass ouses and orchards having reserves to be entirely evoted to pathological investigation. It is intended o adapt the training to meet as far as possible the eeds of the colonies, and it is understood that both the Director (Professor Keeble, F.R.S,) and the consulting ntomologist (Professor Maxwell-Lefroy) are desirous f giving special consideration to West Indian facilities or tropical agricultural education.

It may be mentioned that the Wisley gardens re very ornamental as well as useful, the Rock garden eing one of the most notable of its kind. In many espects Wisley should be a better training ground or the tropics than the Agricultural Colleges hough it is doubtful whether, from a purely educa- ional standpoint, the curriculum of a horticultural ourse is as good as the broader principled and more omplex agricultural one.

Agricultural Banks for Trinidad.

Since 1889, or even earlier, there has been hroughout the West Indies considerable agitation to btain agricultural credit banks. In Trinidad the novement has been particularly vigorous and, it may e added, ineffective, until quite recently. Many years go a People's Bank was established, but this failed, or would it ever have reached the foundation of all ural co-operative concerns even if it had existed, amely, the freeing of the peasant from the money lender. A useful account of the history of the movement for credit banks in the West Indies will be found in the *West Indian Bulletin*, Vol. XIV, No. 1, under the heading of the West Indies and Co-operative Credit.

It would appear that at last the government of Trinidad has decided to take the matter up definitely. We learn that a draft bill has been drawn up, apparently on the lines of the St. Vincent Agricultural Credit Act, which will be found reproduced in the reference given above. This has, however, been somewhat amended since. The main object is to assist and control the formation of Societies along Raiffeisen lines, as in St. Vincent. It is understood that the Director of Agriculture will be Registrar under the Ordinance, and that he may if he think fit appoint Inspectors. The Government has reserved the right to refuse without explanation a license to any proposed society, and it also reserves the right to cancel the registration of any bank for reasons which may appear good and sufficient. Apparently it is intended to govern the system with a firm hand, and we believe that this will be the only satisfactory way of carrying the scheme in Trinidad to a successful conclusion.

Imperial Bureau of Entomology.

Mr. Austen Chamberlain, the newly appointed Chairman of the Managing Committee of the above institution, has presented a very satisfactory and encouraging report on the Bureau's work for 1914. He is able to record the emphatic opinion of the Committee that, for the two years during which it has been established, the Bureau has more than justified its existence. The most gratifying recognition of its work is perhaps the unsolicited testimony that has been extended from abroad. Thus Professor Kulagin, the distinguished Director of the Moscow Agricultural Institute, writing to the Director of the Bureau (Mr. G. A. K. Marshall) on the subject of the *Review of Applied Entomology* (one of the Bureau's publications) said: 'I am prepared to serve you as far as I possibly can. Your journal is necessary for all entomologists, and it is the duty of all of us to help you.' And Mr. E. Porter Felt, the State Entomologist for New York, recently wrote: 'I wish to voice my personal appreciation of the Review published, and to express the hope that it will be continued along substantially the same lines, since with the passage of years it is going to be an exceedingly convenient medium for keeping track of work in all branches of entomology.'

The Bureau is at work in all parts of the Empire, and has very fine collections of economic insects in its possession. By means of these, determinations can be made for entomologists in the colonies and elsewhere, and track kept of the distribution of pests and their parasites. The Imperial Bureau of Entomolgy has on many occasions rendered valuable assistance to the Imperial Department of Agriculture in the West Indies.

INSECT NOTES.

THE ACROBAT ANT.

Amongst the matters receiving consideration on the part of the Entomologist of the Imperial Department of Agriculture during his recent visit to Grenada was the small ant known as the Acrobat ant (*Cremastogaster* sp.), which it is suggested may possibly become troublesome in cacao fields in that colony. This insect, or perhaps a closely related species of the same genus, was described in the *Agricultural News*, Vol. XIII, p. 298, for September 12, 1914.

The acrobat ant is a small black or very dark-brown ant which lives on trees and other places, and is characterized by the habit as it were of turning up its abdomen over its back.

This insect was found to be abundant in different parts of the island, and, from what could be learnt, during a recent visit to Grenada by the Entomologist of this Department, the opinion was formed that it is well known to planters and that it occurs all over the island.

It was noticed that the insect often occurs in great abundance on a small, well defined area, and that at a distance of a few yards there are none to be found. Not many places were seen in Grenada where the acrobat ant was actually doing much harm, but from what was discovered in other ways, and from what is known of the Barbados acrobat ant, the insect is to be regarded as possessing great possibilities of becoming a cacao pest in the future. It would seem likely that the acrobat ant may become the most serious pest in Grenada. Some of the features in the economy of this insect which make this outcome seem possible are the following:—

LOCATION OF THE NESTS. The nests of this species are formed in crevices of the bark or wood of living trees, in or upon dead trees, in fences and out-buildings. Broken or splintered wood resulting from bad pruning, loose bark from the same cause, a leaf adhering to the surface of the bark—all these give nesting opportunities to the acrobat ant, while the central pith in a cut branch or the burrows or tunnels of boring insects are specially attractive to them for the purpose.

SIZE OF THE NEST OR COLONY. The acrobat ant lives in very small colonies. Often the nest is no more than the collection of a few workers, eggs, larvae, pupae, and of course one or more egg-laying females located under a leaf or portion of bark. The destruction of nests or colonies when they are so small, so numerous, and so well protected, would present enormous difficulties in attempting measures of control.

METHOD OF FEEDING. This species of ant damages trees directly. The ants get into cuts made by pruning, and into wounds made by boring insects, especially when the bast and cambium are exposed, and they seem to feed there in such a manner as to prevent these cuts and wounds from healing over.

ASSOCIATION WITH OTHER INSECTS. In nearly every instance where the acrobat ant was noticed on cacao in Grenada, it was associated with the mealy-bug (*Pseudococcus citri*), and in most cases where the mealy-bug was seen the acrobat ant was also present

The only remedial measures which seem practical at present have to do with better pruning and care of the cacao trees with a view of eliminating breeding places of the ant as far as possible, and of preventing the damage resulting from the feeding of the ants on exposed cambium and bast tissues.

The cacao tree would seem to be protected from this ant by nature, since its hard, smooth bark offers very little opportunity for its nests. Trees with a rough scaly bark, like mahogany for instance, are very suitable for this purpose.

In this connexion it may be stated that while on certain estates evidences of excellent pruning methods and good care of trees were seen, other cacao trees were observed which were much neglected in this respect: dead stubs, cavities of all sizes resulting from borer attacks which had been neglected or badly treated, or from the rotting out of cut stubs or broken branches, being much in evidence. This condition is favourable to the ant, and all well-directed effort toward better care of the trees will have an effect in reducing the numbers of this insect.

It was judged from what was seen that the cacao planters require some dressing for wounds made in pruning, more efficient than anything they have at present. The effects of good pruning are lost to some extent because the dressing used does not protect the wood until it heals over, and the wood rots out; cavities are thus produced which tend to shorten the life of the tree. At the present time, lead paint, coal tar, and rosin oil, to which tar is added to give colour, are the wound dressings used on cacao trees. It is suggested that trials might be made with Solignum carbolineum and similar wound preservatives.

H.A.B.

NOTES FROM CROWN COLONY REPORTS.

The Annual Reports on the Crown Colonies for 1913-14 have just been received. Most of the information contained therein dealing with West Indian agriculture has already appeared in past numbers of this Journal. Most of the following matters, however, have so far not received attention.

In the report on British Guiana it is stated that there is room for considerable development in regard to fisheries in several directions, especially in sea fishing, curing with the aid of ice and smoking. Salt cod, herrings, and mackerel are imported in quantity but no colony fishes are cured. During 1913-14, fish glue or isinglass from the gilbaker was exported to the amount of 15,197 lb. value £1,286 13*s.* 4*d.*

In connexion with the export of agricultural produce from British Honduras, the report on that colony states that all the bananas exported went to the United States, the rum to the Republic of Honduras, the sugar to Mexico, and the tortoise shell to the United Kingdom. It may be noted that 938 barrels of grape fruit and 8 barrels of oranges were exported to the United States. They were not inconsiderable shipments of sponges and tortoise shell, the amount being in 1912, 10,488 lb. and 3,627 lb., respectively. There was a large decrease in the export of sponges in 1913 but an increase in the turtle shipments.

Interesting figures are given in the Trinidad and Tobago report concerning the export of mineral oil. In 1911 the value of the exports was £32,839, which rose to £75,020 in 1913. A considerable quantity was consumed locally, either as fuel in the sugar factories or, after having been refined, as petrol and kerosene. A section of interest in the Report is that devoted to the subject of Crown land. It is stated that the price of Crown land is £2 10*s.* per acre, including the cost of survey and other charges, and it is sold to the applicant without competition. The work of reafforesting the Crown reserves continues to be actively carried on, and the operations of the department are growing so extensively that it has been found necessary to make provision for the appointment of an assistant Forest Officer.

An interesting feature of the statistics in the Grenada report is the information showing the distribution of exports. The United Kingdom and British Colonies took 62 and 2 per cent., respectively. To the United States 24 per cent. of the exports was sent. At the conclusion of the report the Colonial Secretary adds the following note of warning: Grenada depends for its prosperity, almost for its existence

at present, upon cacao and spices, and the highly remunerative prices obtained for these staples have resulted in the neglect of other industries. Were the price of cacao to fall below remunerative production, the Colony would be in sore straits, and the necessity for adopting a policy of broadening its productive capacity by the encouragement of minor products, such as ground provisions, for supplying local demands, which now depend on imported foodstuffs, more particularly on the land settlements, is urgent and imperative.'

In connexion with the cotton industry in St. Vincent, it is stated in the Report on that colony that about 45 tons of cotton seed of the 1913-14 crop were crushed by the disintegrator at the Government Ginnery for manurial purposes. The price of lint during the year was for some special bales as high as 40*d.* per lb. The average sale price was, however, 17*d.* to 20*d.* for Sea Island cotton; Marie Galante sold from 6*d.* to 10*d.*

The export of whale oil was £340 in 1912-13 and £317 during the year under review. This, as was remarked in last year's report, is a dying industry, owing to the reduction in the number of whales visiting these waters. Numerous species of sponges are to be found in the Grenadines, some of which are said to be of commercial value, but unfortunately it has not yet been found feasible to investigate the possibility of the establishment of a sponging industry.

The turtle industry showed an export value of £380, as against £85 in 1912-13, £302 in 1911-12, and £176 in 1910-11.

The exports from the island of St. Lucia have in the past ten years shown a gradual increase, culminating in £274,460 for 1913-14. It may be noted that while the exports of island produce have thus increased, the percentage of sugar and cacao exports has gradually fallen from 93·3 to 87·1, indicating an extension in agriculture in other directions than those of the two principal products. This increase is seen principally in the case of limes, the exports of which have steadily increased during the past ten years.

A large proportion of the space in the Leeward Islands Report is devoted to an account of agricultural progress taken from the various departmental reports issued by this Department, thereby indicating the value which is attached to the information which they contain.

In Jamaica it is noted in connexion with the work of the Government Laboratory, that the public milk supply still remains unsatisfactory in that island, 29 per cent. of the samples tested having been found to be diluted with water. As regards education, the average school attendance has increased by 122 per cent., while the population has increased 55 per cent. Literary education has improved greatly in quality and wider scope has been given to teaching in the elementary schools, embracing preparation for industrial pursuits.

According to the Report on the Cayman Islands, general prosperity depends to a very large extent in the case of Grand Cayman on the price obtained from the sale of turtle. Contracts which hitherto have been entered into for one year with foreign buyers have been superseded during the last year by contracts in the majority of cases of five years' duration to take effect from the 1st of January next. The contracts have been made by a representative of a company that contemplates establishing a turtle-canning factory in Grand Cayman.

In the Lesser Islands, coco-nuts form the staple industry, but, unfortunately, in spite of the most strenuous measures, the dreaded bud-rot disease still continues to make headway, a circumstance that gives rise to grave anxiety for the future of these islands.

AGRICULTURE IN THE FEDERATED MALAY STATES.

It appears from the Selangor Administration Report for 1914 that the approximate areas under different kinds of cultivation in that State last year were as follows:—

	Acres.
Rubber — — — —	245,503
Coco-nuts — — — —	35,092
Coffee — — — —	9,953
Padi — — — —	9,448
Various — — — —	22,000

Rubber shows a substantial increase over the previous year's figures, but there is a decrease under the head of coco-nuts. The latter is inexplicable, as the cultivation of coco-nuts is steadily extending. The area under padi has increased by nearly 3,000 acres, and the development of this form of cultivation is most satisfactory.

As regards Negri Sembilang, the State Administration Report for 1914 gives the following figures as showing approximately the areas devoted to the principal products cultivated in that State last year:—

	Acres.
Rubber — — — —	117,000
Padi — — — —	28,000
Coco-nuts — — — —	20,000
Gambier — — — —	4,500
Tapioca — — — —	1,300
Fruit trees — — — —	12,000

About 3,300 acres are under various other products. (*Journal of the Royal Society of Arts.*)

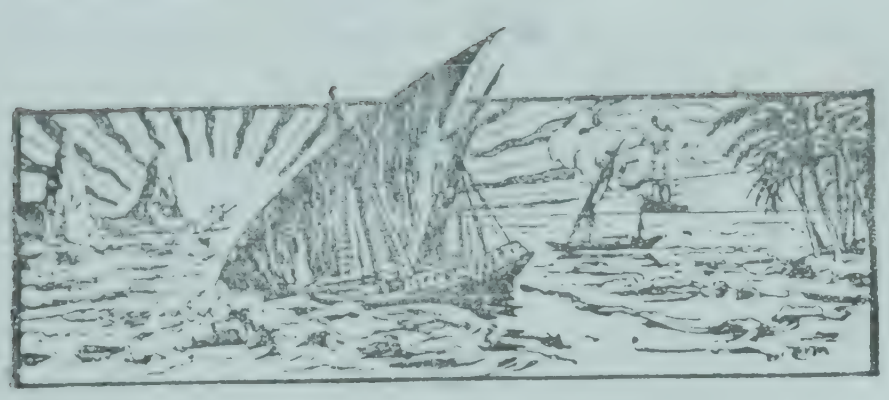
MANJACK DEPOSITS IN THE BRITISH WEST INDIES.

There are in the island of Trinidad large deposits of manjack, especially in San Fernando section, where are situated the Vistabella and the Marabella properties. During the past decade approximately 18,000 tons were exported in a crude state.

In outward form and general appearance manjack is not unlike fine coal, and is essentially a bituminous substance. It is an oil residuum occurring in lenticular seams between walls of peculiar clay, which appear to have absorbed the oil under very heavy pressure. It is jet black in colour and resinous in its nature, and has long been known for its insulating properties in the manufacture of electric coils, dynamos and generators.

From a recent report by the United States Consul in Trinidad, it appears that the Vistabella manjack properties are worked under a long lease by an American company, which, besides exploiting and exporting manjack in its natural state, has undertaken the manufacture of certain well-defined compounds. One of these is a high-grade black manjack paint for use on smokestacks and on boilers, both inside and out; another is a preparation suitable for greasing pipe threads, dressing wire rope, etc.

Barbados manjack is of two varieties—the conchoidal and the columnar. The first is the more valuable, and a newly-fractured specimen cannot be distinguished from jet, so far as outward appearance is concerned. At the present time the exportations are mainly to the United States, where Barbados manjack is used in the manufacture of high-grade insulating black varnish. (*Journal of the Royal Society of Arts.*)



GLEANINGS.

The death is recorded in *Nature*, of Mr. M. Manson Bailey, of Brisbane, at the age of eighty-eight years. Mr. Bailey, who died on June 25, was Colonial Botanist for Queensland from 1881 until within a short time of his death.

According to the *Louisiana Planter* for August 28, 1915, the tremendous development of the cane-sugar industry in Cuba during the past year is almost beyond conception, and is without parallel in the sugar industry of the world.

The reports from the present Java sugar crop, says the same journal, are very bad; not only is the tonnage of cane per acre uncommonly low in most districts, but the sugar content is likewise unsatisfactory. This is already the fifth year in succession of bad results, which in every case has been attributed to dry weather in the months of November and December.

Although spraying or dipping is the best means of eradicating ticks, the *Planter's Chronicle* for July 17, 1915, says that a useful remedy consists in anointing the infested parts of the animal's body with cod liver oil. Flies, especially, are killed immediately by contact with the oil. It is added that no caustic effect to the skin of the animal is produced by this oil as in the case of other fish oils.

The *Proceedings of the Institute of Chemistry of Great Britain and Ireland*, Part 3 of 1915, contains interesting correspondence concerning the chemical aid given to certain industries since the outbreak of war. In the case of glass-making it is evident that the Institute has done a great deal in order to enable English firms to produce articles that were previously obtainable only from Germany or Austria.

According to the *Mindanao Herald*, a corporation has been organized with a capital of 800,000 pesos, all private capital, to construct a railroad on the island of Negros. The railroad will traverse the sugar district. Surveyors are already at work on the right of way. An account of the sugar industry in this portion of the Philippines appeared in the *West Indian Bulletin*, Vol. X.

In connexion with the article on the cultivation of sesame which appeared in this journal some months ago, the following figures from *Modern Cuba* for August, concerning the yield of products from 100 kilogrammes of seed may be of interest. The figures are as follows: superfine oil, 30 kgs.; fine oil, 10 kgs.; common oil, 10 kgs.; cakes, 48 kgs.; loss, 2 kgs. When obtained by the cold process, sesame oil is sweet, of pleasant flavour, and may be substituted for olive oil for home uses.

It is stated in the *Review of Applied Entomology*, Vol. 3, Series B, part VII, that Dr. J. C. MacPherson, the senior medical officer of Montserrat, says that, though it has often been reported that no anopheles existed in the island which might act as malaria carriers, specimens of *Anopheles* (Celia) *argyrotarsis* have been found at Elberton, and that it is of interest to note that fever, possibly of malaria origin, was said at one time to be very common in this region.

The editorial in *Tropical Life* for September 1, deals with the subject of encouraging the expansion of agricultural industries. One appropriate and helpful means would be for the higher educational institution of all nations, instead of exchanging courtesies through their teams of athletes, to send select bodies of their best students under competent leadership for the purpose of studying specifically set problems.

Agriculture in the real sense of the word may be described as non-existent in the islands of Grand Turk, Salt Cay and South Caicos. At Middle and North Caicos and at Blue Hill, however, the outlook for agriculture is of a more hopeful character, and provided the people, who at present possess no knowledge whatsoever of the subject, can be instructed and induced to take up the cultivation of cotton, there seems to be no reason why the condition of land-owners in these islands should not be materially improved (*Colonial Reports—Annual*, No 844.)

Nature for August 26, 1915, reproduces an account of a new method of standardizing normal and decinormal solutions of acid used in analysis. Use is made of potassium hydrogen phthalate which is easily prepared in a pure state by dissolving phthalate anhydride in potassium hydroxide and recrystallizing the product. The salt, when dried at 110° is anhydrous, $C_8H_4O_4$ HK, and behaves like a mono basic acid, the end-point in the titration being remarkably sharp. We think that this method may be found useful in West Indian laboratories.

The report on Land Settlements in St. Vincent (*Colonial Reports*, Miscellaneous No. 90) has just come to hand and contains an account of progress from January 1911 to March 1914. In regard to St. Vincent itself special mention is made of the recent acquisition of Belair estate. An independent report appears on the Land Settlement Scheme of Union Island in the Grenadines. The Superintendent of Crown Lands concludes by saying that there can be no doubt that the Land Settlement Scheme has continued, since Mr. Tatham's report, to improve the condition of the labouring class in St. Vincent. Equally satisfactory results have been obtained in the Grenadines.

A new nitrite-forming organism is described by Mr. N. V. Joshi, B.A., in the *Memoirs of the Department of Agriculture in India*, Bacteriological Series, Vol. I, No. 3 The organism described is a new one, differing morphologically from others hitherto known. Its thermal death point lies between 70°C and 80°C.; the optimum temperature for its activity is between 25°C. and 35°C. The most effective base for nitrite formation is calcium carbonate. An increased proportion of carbon dioxide in the atmosphere (50 parts per 100) acts as a stimulus to the activity of this organism; further increase of carbon dioxide has a retarding effect. In solutions containing phosphates, ammonium chloride, sulphate and carbonate, asparagin and urea, all serve as sources of nitrogen for nitrite formation. In the absence of phosphates, ammonium carbonate is the only substance which is easily changed into nitrite.

A YEAR'S WORK IN PORTO RICO.

Porto Rico, with an area of 3,600 sq. miles, has a population of over one million. The population is increasing, as is likewise the agricultural production. Porto Rico is an old-settled country, permanent settlements having been made before they took place in the mainland of North America. It is not strange therefore that the natural resources of the country have been thoroughly exploited. The forests have been consumed, and the fertility of the soil, the greatest natural resource of a country, has been very largely depleted by unscientific agriculture. The work, therefore, of the Porto Rico Experiment Station, an account of which, for 1914, is now before us, is necessarily of great importance to the country, and its policy is a progressive and constructive one.

The first part of this interesting report provides a summary of the investigation work that has been carried out by different members of the staff. Much attention has been given to matters of re-afforestation as well as to the improvement of live-stock, the provision of rural credit, and to the introduction into cultivation of fodder and cover crops. These latter together with citrus and coffee, staple productions, will be considered in greater detail later on.

The chemical work performed has had relation to several problems of interest. One which deserves special attention concerns chlorosis of sugar-cane. This condition of the cane plant is seen in the loss of green colour of the leaves and is due to iron starvation. It appears that the application of sulphate of iron to the soil has little effect upon the plant, though where very heavy applications of this substance is given along with pen manure, notable increases have in some cases been noted. In the case of rice and pine-apples, carbonate of lime in the soil seems to be responsible for inducing chlorosis on account of its depressing the assimilation of iron. It should be noted that sulphate of iron applied to the leaves as a spray has been found to restore the green colour and to induce a normal growth; but applied to the soil it is without effect.

Turning to the report of the horticulturist we find reference to matters of great practical interest. In regard to coco-nuts attention has been given to the yield of individual trees. In some of the experimental plots thrifty looking palms bearing but five or ten nuts a year are found growing next to other trees yielding 100 or 140 a year. The importance of seed nut selection by those contemplating a new grove is plainly shown. This matter should receive the same appreciation in the British islands of the West Indies. Some interesting results have been obtained during the year by growing cover crops beneath the trees. It has been found that *Stizolobium* sp. (velvet beans), make good growth and crowd out all native weeds and grass; they have a longer growing season and produce a heavier crop of vegetation than the Canavalias, and are therefore preferable in coco-nut plantations. Amongst the remaining experiments with cover crops the one in which leguminous crops were grown to test the effect of shade trees on pine-apples in somewhat novel. As in the previous year both Jack beans and pigeon peas were found injurious to the two varieties of pine-apples under observation. Similarly growing pine-apples under *Pithecolobium saman* trees resulted in failure of the pine-apples.

The report of the assistant horticulturist deals principally with coffee. It is stated that of all the foreign coffees introduced, the 'Colonaris' coffee is the most promising of those that have been tested on any large scale, and which have come into bearing up to the present time. This variety originated as a sport from the ordinary Arabian type, and was discovered in Java less than thirty years ago. Its cup flavour in excellent. At four years from setting, the yield of an extensive planting averaged about 1 lb. per tree, and had the more favourably located trees only been considered, the rate would easily have been double this. The tree is more vigorous and grows taller than the typical Porto Rican coffee, and it may be necessary to resort to topping to facilitate picking. The bean is a trifle smaller than the Porto Rician, which is a slight market disadvantage. The coffee-fertilizer experiments, it is said, are continuing to show interesting results. In one experiment with more than 100 trees, the yield of the plot which had received complete chemical fertilizer and stable manure was more than 36 per cent. greater than that of the control. Very interesting and valuable data are being accumulated, but as yet the experiments do not show that fertilizer can be applied with a financial gain. It seems quite probable that coffee should be included among the acid-tolerating plants, as benefits from lime alone applied to the acid soils at the Porto Rican Station have been doubtful. Some of the handsomest coffee trees in the Station plantings are in soil which is so acid as to require 1·0527 gramms of sodium hydroxide for the neutralization of 1 kilogramme of soil.

Turning to considerations on other crops, it may be mentioned in regard to cacao that action is being taken to secure exact data regarding yields. The return from an eleven-year old cacao planting has shown an increase of nearly one-third over that of the preceding year. The most productive tree yielded the equivalent of about 4 lb. of dried beans worth 14c. per lb.

Success has attended the raising of vanilla at the experiment station. It is interesting to note that a species known as 'Pompon' from Vera Cruz, Mexico, which has for four seasons shown itself sterile to all pollen from the same plant was this season fertilized by pollen from the *V. planifolia*. It is remarked that some of the vanilla species produce very handsome flowers, which aside from all economic reasons, are well worth cultivating as ornamentals. One of the handsomest of these is the very thrifty Panama vanilla with large yellow blossoms.

Reference is made to economic plants imported from Venezuela, which included a black bean which in that country is a common staple, and which is very vigorous and prolific. A very delicious table corn called 'Cariaco' was also obtained, and this together with the bean are being planted to furnish seed for distribution.

The publication concludes with two technical reports, one by the Pathologist on plant diseases, and the second by the Entomologist on plant pests. These will receive attention in the sections of this Journal devoted to the subjects in question.

PLANT DISEASES.

THE EFFECTS OF EXPOSURE ON LIME TREES.

The question of the influence of wind on lime trees has been recently brought under renewed consideration by a report of the Mycologist of the Imperial Department on conditions in Montserrat. From various considerations it is suggested that an increase of vigour would be obtained as a result of closer protection, which would enable the trees to resist the attacks of root grubs, scale insects, and certain weakly-parasitic root and stem fungi which at present give trouble in that island.

As a contribution to the discussion the Commissioner of Agriculture invited an expression of views on this subject from the principal agricultural officers in Dominica and St. Lucia, these being the islands in which lime cultivation has received most attention. The communications received are given below, and it will be seen that the results of experience in the two islands are in very close accord.

Mr. Joseph Jones, Curator of the Dominica Botanic Gardens, writes: 'Generally it may be stated that 95 per cent. of the lime cultivation in Dominica lies snugly in sheltered valleys or under the protection of windbreaks. Mistakes may be made by planters, particularly young men from England who are engaged in learning planting; but when it is perceived that the fields are subject to persistent winds, and that windbelts cannot be established, or if established, would not adequately protect the lime trees, as in the case of rising ground, then attempts to establish lime fields under such conditions are abandoned.

'I have in my mind's eye a picture of a large field of limes on a Windward estate. The lower part of the field is protected by windbelts, the results in crop being good. The upper part of the field is exposed to the trade wind. Here the trees are stunted, with the usual dead tops, and the crop obtained does not pay the cost of weeding the field.

'Lime trees can and do stand a considerable amount of wind provided there are periods of comparative calm between when young growth can be made and hardened. It is the persistent deadly trade wind which blows for months on end that is to be feared. This stunts the plants from the start and portions of the small branches dry up, but the trees do not die. They struggle on, and with alleviating conditions, such as windbreaks, may ultimately succeed, but do not become first rate cultivations. I do not know of any lime trees, young or old, being actually killed by the effect of the wind. Possibly this is due in a measure to guava and other bush springing up quickly in abandoned fields and affording some protection.

'There have been cases in which young planters, ignorant of the effect of the wind on lime cultivation, have considered windbreaks unnecessary and caused them to be cut down. In each case the results have been disastrous. The only means of again improving the cultivation and making it profitable is by the long process of establishing new windbelts.

'In Dominica experienced planters and all the peasants know that the chief enemy to cultivation is persistent wind. This knowledge has become ingrained owing to long association with cacao cultivation. The importance of thoroughly understanding the effect of wind on cultivation may be illustrated as follows: Suppose that two island communities with similar climatic conditions and topographical features were about to embark on lime cultivation. Suppose that in one island sugar had been the staple crop, in the other, cacao. There is no doubt in my mind that the cacao planters would build up a successful lime industry while the cane planters were blundering along, because one community (cacao growers) had been compelled to study the effect of the wind on cultivation, and would act on the knowledge gained, and the other (cane growers) had no particular need to trouble about it, and consequently would give little or no thought in the initial stage to this important factor in lime growing.

'Although lime trees can stand much more wind than cacao, there is no doubt that this cultivation must receive a considerable measure of protection if good results are to be obtained.'

Mr. Archibald Brooks, Agricultural Superintendent, St. Lucia, writes: 'If the plants are set out in a field exposed to strong winds the plants do not make good growth in the early stages. They form smaller leaves, often only half the size of those previously formed in the nursery beds. The shoots are stunted and often possess more spines than leaves. The plant seldom if ever dies from the wind, but lingers until killed by pests or disease.

'Sometimes young limes are planted in such situations that they are only exposed to strong winds at certain seasons of the year (about March and April); in such instances the plants make good growth during the rainy season, and are partly stripped of their leaves during the months mentioned. This sometimes accounts for lime plants being found in a lingering state when eight or ten years old.

'Again limes are often planted where they have sufficient protection during the first few years, but later their tops extend beyond this protection and at once become stunted.

'I doubt very much if there is any authentic case on record where any lime tree has been directly killed by wind.

'Wind is undoubtedly one of the greatest evils with which we have to deal in lime cultivation, and I believe it will be found that the condition of much of the diseased and unprofitable lime cultivation now existing is indirectly caused by insufficient protection.

'Limes should be protected from wind in exactly the same way as cacao, not with the object of maintaining a heavy humid atmosphere such as cacao requires, but one sufficiently humid to prevent the young shoots and leaves from becoming wind-hardened.

'Whether the lime tree is originally planted in an exposed position or whether it extends until it becomes exposed does not affect the case. From the time of its exposure to wind its progress is stopped and it becomes unprofitable and unhealty until the conditions are improved.'

The actual physiological effects which wind, or, it would be better to say, exposure produces in the plant organs have as yet received little attention. Reduction in size and increase in thickness of the leaves is well known to occur in many plants as a reaction to conditions which tend to induce increased transpiration, or where the supply of water is for any reason inadequate. The effect of this reduction on the economy of the plant has not, so far as the writer is aware, been closely investigated, but it stands in familiar association with reduced or even stunted growth. No doubt it is some degree of this condition which Mr. Brooks refers to as 'wind-hardened'. It is evident that for economic efficiency the lime tree requires to be grown under circumstances in which it is free to develop the softer and more generous type of foliage. The factor controlling this ability is atmospheric humidity, which in exposed situations is liable to be dispersed by the freely moving air. Hence the need for wind-breaks.

The writer has little doubt that another factor is of considerable importance, not so much in the typical districts

of Dominica and St. Lucia perhaps, but on lands such as those of Montserrat where the country is more open and the dry season more pronounced, namely, the loss of moisture from the upper layers of the soil. The lime is normally a surface feeding tree. When grown in districts liable to seasonal drought the root system develops at a somewhat deeper level, but indications have been found that the fibrous roots developed in the wet season are killed out in the dry months, sometimes to a serious extent. One of the results of exposure is a marked increase in this effect. It is permissible to enquire whether in some cases the highly beneficial results obtained from heavy applications of vegetable mulch have not been largely due to its action as a soil covering rather than to the manurial effects more commonly attributed to it in this connexion. The quickness of the results obtained in some observed cases seems to support this view. On the other hand, the presence of large quantities of growing herbaceous vegetation about the trees increases the rate of loss, and it would seem desirable to reduce its transpiring surface as much as possible by cutting it just before the advent of the dry season.

W.N.

AGRICULTURAL PROGRESS IN FIJI.

Though much larger than the West Indies, the islands of Fiji possess with us many features in common, and the following note from a recent Colonial Report as to the progress of planting in 1914 may be of interest. The figures given do not include native cultivation, and so far as Europeans are concerned can only be taken as estimates, owing to the disinclination of some of the planters to furnish particulars of their cultivation.

The number of acres under cane in 1914 was 62,851, as against 48,208 in 1913, and the number of tons of cane produced was 874,164 in 1914, as against 736,992 in 1913.

Notwithstanding these increases the export of sugar decreased from 94,710 tons in 1913 to 92,112 tons in 1914, which is to be attributed mainly to unfavourable climatic conditions.

The area under coco-nuts cultivated by Europeans was estimated at 42,492 acres in 1914, as against 32,915 acres in 1913. Returns from the Lau District are included for the year 1914, and account for 5,297 acres of the apparent extension of the area under coco-nuts.

The copra industry, it is satisfactory to note, has improved, The exports for 1913 had been reduced considerably as a result of a storm affecting the yield of plantations, and the quantity exported may be expected to reach the normal rate before long. During the early stages of the war the local price for copra was very low and little or none was offered for export. Later on, as the market price recovered somewhat, shipments began again and the industry had settled down before the end of the year.

The area under bananas cultivated by Europeans was estimated at 6,667 acres in 1914, as against 6,608 acres in 1913. A considerable amount of this fruit is also grown on native plantations. The area under bananas was increased considerably during 1914, and a corresponding rise in the exports was anticipated. This was realized only in a partial degree owing to the contraction of shipping facilities in consequence of the war.

The estimated area under cotton in 1914 was 530 acres, as against 23·7 acres in 1913. Some progress has been made in encouraging Indians holding small leases to grow cotton.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of July:—

A fair amount of business continues to be transacted in the London drug and spice markets. The quantities of drugs and chemicals imported week by week go to prove the activity that still prevails in the overseas commerce. Notwithstanding Germany's continued submarine barbarism prices all round continue to advance, though citric acid has been somewhat easier since our last report. The following details will show the position of the principal West Indian products at the time of writing.

GINGER.

At auction on the 25th. 209 barrels and 268 bags of Jamaica ginger were offered, of which 112 found buyers at the following rates: 65*s.* 6*d.* to 67*s.* per cwt. for middling bold, 62*s.* to 63*s.* for low middling, and 58*s.* to 60*s.* for good ordinary. The offerings of calicut and Cochin were all bought in at the following rates: 27*s.* per cwt. for brown rough calicut and washed rough Cochin, and 30*s.* for brown cuttings. Some small cut calicut in cases was bought in at 40*s.* to 42*s.* 6*d.*

MACE, PIMENTO AND ARROWROOT.

At the same auction on the 25th, West Indian mace sold at 2*s.* 4*d.* per ℔. and Eastern at 2*s.* 3*d.*; pimento at $1\frac{7}{8}$*d.*, and St. Vincent arrowroot at $2\frac{1}{8}$*d.*, at which rate 108 barrels were disposed of. Good Natal realized $8\frac{1}{4}$*d.* per ℔.

SARSAPARILLA.

At the drug auction on the 12th of the month, sarsaparilla was in good supply as follows: Grey Jamaica 50 bales of which 25 were sold. Lima-Jamaica 10 of which 8 were sold; native Jamaica 26, and 21 sold Honduras 47 and none sold. The 25 bales of grey Jamaica realized 1*s.* 9*d.* to 1*s.* 10*d.* per ℔. for fair fibrous, the 8 bales of Lima-Jamaica 1*s.* 8*d.* per ℔. for good, and of the native Jamaica, dullish red realized 1*s.* 1*d.* per ℔., good red 1*s.* 2*d.*, and dull to fair red 1*s.* to 1*s.* 1*d.*

CITRIC ACID, LIME OIL, CASSIA FISTULA, ANNATTO SEED, CASHEW NUTS, AND KOLA.

Citric acid has been easier as the month progressed, starting at 3*s.* 4*d.*, to 3*s.* $4\frac{1}{2}$*d.* per ℔. it dropped in the course of a week to 3*s.* 3*d.* and at the close to 3*s.* 2*d.* per ℔. In the early part of the month lime oil was much in demand, without any supplies. It was reported that as much as 9*s.* per ℔. had been paid for a small lot of West Indian distilled. The position remained unaltered at the time of writing. The supply of Cassia Fistula has almost ceased throughout the month, and enquiries have been made for it in the sale rooms. The large quantity of 210 packages of annatto seed was offered in the middle of the month, but none was sold. It was said that fair dullish East Indian could be obtained at from $7\frac{1}{2}$*d.* to 8*d.* In the middle of the month a lot of some 60 packages of cashew nuts was offered, 29 of which sold at 9*s.* per cwt. It was stated that they were in a badly weevilled condition. Nineteen packages of kola were also offered at this sale and disposed of at the following rates: fair dull Jamaica halves $6\frac{1}{4}$*d.* to $6\frac{1}{2}$*d.*; fair Java $6\frac{1}{4}$*d.*, small dull halves 6*d.*, and pickings 5*d.*

MARKET REPORTS.

London.—The West India Committee Circular, September 7, 1915.

Arrowroot—2*d.* to 4¾*d.*
Balata—Sheet 2*s.* 4½*d.* to 2*s.* 5*d.*; block 1*s.* 9*d.*
Beeswax—No quotations.
Cacao—Trinidad, 81/- to 85/- per cwt.; Grenada, 76/- to 80/-; Jamaica, 72*s.* to 73*s.*
Coffee—Jamaica, no quotations.
Copra—245*s.* to £24 15*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 13*d.* to 16*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 55/- to 75/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/8 to 3,9; concentrated, £30; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—9*d.* to 2/11*d.*
Nutmegs—4¼*d.* to 5¾*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 2/4½; fine soft, 2/3; Castilloa, 2/1½.
Rum—Jamaica, 4/2 to 4/9.

New York.—Messrs. Gillespie Bros. & Co., September 17, 1915.

Cacao—Caracas, 16¾c. to 17c.; Grenada, 17c. to 17½c.; Trinidad, 17½c. to 18¼c.; Jamaica, 14½c. to 15c.
Coco-nuts—Jamaica and Trinidad selects, $25·00 to $27·00; culls, $16·00 to $17·00.
Coffee—Jamaica, 7¼c. to 11c. per lb.
Ginger—13c. to 16c. per lb.
Goat Skins—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 38c. to 40c. per lb.
Grape Fruit—Jamaica, $2·75 to $3·25.
Limes—$5·00 to $6·50.
Mace—39c. to 52c. per lb.
Nutmegs—11c. to 11½c.
Oranges—Jamaica, $2·15 to $2·50.
Pimento—3¼c. per lb.
Sugar—Centrifugals, 96°, 4·42c.; Muscovados, 89°, 3·77c.; Molasses, 89 , 3·04c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., September 20, 1915.

Cacao—Venezuelan, $17·75 to $18·25; Trinidad, $17·50 to $18·25.
Coco-nut Oil—75c. per Imperial gallon.
Coffee—Venezuelan, 9c. to 11c. per lb.
Copra—$4·25 to $4·40 per 100 lb.
Dhal—$6·75
Onions—$2·25 to $2·50 per 100 lb.
Peas, Split—$9·75 to $10·00 per bag.
Potatoes—English $1·25 to $2·00 per 100 lb.
Rice—Yellow, $5·80 to $6·25; White, $5·25 to $5·50 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 2, 1915.

Arrowroot—$4·50 to $4·60 per 100 lb.
Cacao—$15·00 to $16·00 per 100 lb.
Coco-nuts—No quotations.
Hay—$1·70 per 100 lb.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia, $90·00 per ton.
Molasses—No quotations.
Onions—$4·00 per 190 lb.
Peas, Split—Canada, $10·00 per 120 lb.
Potatoes—Nova Scotia, $2·75 per 160 lb.
Rice—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—American granulated, $6·00.

British Guiana.—Messrs. Wieting & Richter, September 18, 1915; Messrs. Sandbach, Parker & Co., September 17, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$9·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	15c. per lb.	16c. per lb.
Cassava—	$1·20	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	——	10c. per lb.
Dhal—	$6·50	——
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	5c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	5c. to 6c.
Plantains—	24c. to 40c.	——
Potatoes—Nova Scotia	$3·00	$2·60
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·68	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
Tannias—	$3·12	——
Yams—White	$2·64	——
Buck	$3·36	——
Sugar—Dark crystals	$3·75 to $3·85	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

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Soil Ventilation.

MR. ALBERT HOWARD, C.I.E., M.A., Imperial Economic Botanist in India, has recently drawn attention* to the fact that the necessity for irrigation, dry farming methods and water conservation has, in many places, tended to obscure from the minds of soil investigators, the importance of the air supply of plant roots. Even the subject of drainage, so largely connected with air supply, has not been adequately regarded from this most important aspect, and it seems that the neglect referred to may be responsible for low yields, and, what is perhaps less likely to be realized, for the restricted distribution of certain crops.

Constant aeration and a continuous interchange of gases between the soil and the air are absolutely necessary for plant growth. The roots of plants respire; which means that they not only use up the oxygen of the soil atmosphere but as well give out carbon dioxide. This gas, which in large proportions acts as a poison, is also produced by the decay of organic matter and as the result of the growth of bacteria. Unless copious ventilation takes place, the supply of oxygen will be exhausted, and at the same time the soil and water may become charged with carbon dioxide to such an extent that a poisonous atmosphere for the roots is produced. Growth will stop for two reasons. In the first place there will be no air for the working cells of the roots and they will die of asphyxiation. In the second place there will be direct inhibition of large quantities of carbon dioxide which has been shown to be a poison for roots.

Reference is often made to water-logged soils, which as everyone knows are generally unsuited for plant growth. But it is not the water that does the harm nearly so much as the absence of oxygen. If a water-logged soil could be kept aerated it would produce good crops. This is made evident by the fact that plants can be successfully grown in 'water-culture' where the surface of absorption is great in comparison with the volume of liquid. The case of rice which grows in swamps would appear to be conflicting. But it has a simple explanation. As already noted in this journal,† Harrison in India has shown that the surface film of algae and other green organisms on these soils

**Bulletin No. 52*, Agricultural Research Institute, Pusa, India.

†*Agricultural News*, Vol. XIV, No. 339, p. 141.

plays the leading part in the formation of the oxygen required by the roots of the rice. Certain cultural operations after harvest also help to conserve a store of oxygen in the soil subsequent to the arrival of the rains.

It is evident therefore, that the presence of oxygen is an essential factor in soil fertility as regards the growth of crops. It is equally necessary in relation to the development of bacteria. This latter aspect of the subject is sufficiently interesting and important to warrant special consideration. In the first place it may be pointed out that an adequate supply of air is especially important for leguminous plants. As is well known, the roots of these plants are provided with special factories (nodules) in which, by means of bacteria, atmospheric nitrogen is worked up into complex nitrogenous substances which the plants can use as food. Both oxygen and nitrogen, the chief constituents of the air, are essential raw materials for these factories and must therefore be provided if these plants are to thrive. This can only be done by efficient soil ventilation, and by the provision of ample means of gaseous interchange between the soil and the air. In connexion with this, Howard goes so far as to say 'there can be no question that the future of Java indigo (a leguminous plant) in Bihar depends on soil ventilation . . . the present chances of the industry are most hopeful if only the planters are willing to place the cultivation of the crop on a proper basis and give up their present methods.

On another page in this issue the conclusions arrived at by J. H. Walton† B.A., B.Sc., concerning the fixation of nitrogen by the free-living organism Azotobacter in Indian soils are given. From our present point of view his most interesting conclusion is the beneficial influence of good cultivation of the soil (i.e., aeration) upon the organism's activities. In one experiment two plots were taken, and in the case of the first, the soil was left untouched while in the second plot the soil was cultivated weekly to a depth of 6 inches. At the beginning of the experiment, Plot 1 contained 65·2, and Plot 2, 63·8 milligrammes of nitrogen per 100 gms. of soil, respectively. After the elapse of ten weeks, the soils were re-analysed, and Plot 1 was found to contain 64·4 and Plot 2, 66·5 milligrammes of nitrogen per 100 grms. of soil. In Plot 1, therefore, there was a loss of 0·8 milligrammes, while in Plot 2, which was cultivated, there was a gain of 2·7 milligrammes. The importance, indeed the necessity of a good supply of oxygen for azotobacter has been noted by all previous investigators. S. F. Ashby, B.Sc., formerly of Rothamsted and now Microbiologist to the Jamaica Department of Agriculture, strongly emphasizes this in his paper on the assimilation of atmospheric nitrogen,‡ and although he has isolated the organism from cultivated soils in Jamaica† it had not at the time of writing the paper referred to below been found in old pasture and old meadow land. Its absence was no doubt due to acidity and anaerobic conditions induced by the permanent cultivation.

The reference which has just been made to permanent crops may arouse a desire in the reader's mind to enquire how the roots of grass fare as regards aeration. Probably the roots of grass secure their air supply through being so near to the surface of the soil. Further, an important agent of aeration is the common earthworm and possibly ants and termites. It will be remembered as well that of all cultivations pastures require drainage most. This secures not only the removal of superfluous water but also means the suction of air through the soil. Gaseous interchange is also brought about by the law of diffusion of gases and by variation in atmospheric pressure and temperature. These explanations would appear sufficient to meet what might first be regarded as an anomaly.

In connexion with grass, an interesting comment, on the work at Woburn on the effects of grass on the roots of trees, is made by Howard in the paper referred to at the beginning of this article. The Duke of Bedford and S. U. Pickering at the above-mentioned place, consider that grass roots give off a toxin which poisons the tree roots. This toxin however, has not yet been isolated, but its presence is inferred from the results of numerous experiments. These authors have now studied the influence of grass on other crops like tobacco, and have come to the conclusion that 'every growing crop results in the formation of a substance which is toxic to the growth of other plants and still more so to itself.' Howard states that the results obtained in the case of tobacco are exceedingly like those observed at Pusa when tobacco is water-logged or grown on heavy lands which have been green-manured. It is well known that the roots of the tobacco crop require a great deal of air, and it is also known that green manuring results in the production of much carbon dioxide in the soil. It seems probable that the Woburn results, in which the wash-

†*Memoirs of the Department of Agriculture in India*, Bacteriological Series, Vol. I, No. 4.

‡*West Indian Bulletin*, Vol. VIII, p. 96.
†*Journal of Agricultural Science*, Vol. II, p. 35-51.

ings from grass interfered with tobacco, may after all be due to the inhibiting effect of carbon dioxide. This may be the toxin about which so much is written, and it may turn out to be the explanation, not only of the effect of grass on trees but also of the influence of one crop on another. Experiments to test this view in the case of fruit trees are now in progress at Pusa.

The most striking idea in Howard's paper is perhaps the relation of soil ventilation to the distribution of crops or the ecological aspect of agriculture. Crops undoubtedly differ greatly in the amount of air their roots require. In India, for example, gram requires a great deal of air and only a moderate amount of water. In some parts of the country the conditions both natural and artificial are such that the roots get plenty of air. Here this particular crop thrives. But in other places where for instance irrigation conditions obtain, gram will not grow successfully. The proper provision of air to the soil is all that is necessary for extending the cultivation of this most useful crop. The same thing has already been mentioned in regard to indigo, and Howard states that the industry would never have had declined and would have successfully competed with the synthetic product, if planters had realized the plant's special requirements and had acted accordingly.

There can be no harm in considering the ideas expressed in this article from a West Indian point of view. Coco-nuts, we know, do not mind water as long as it is not stagnant; the tree will grow luxuriantly even if its roots are continuously bathed in water. Is this not a question of aeration? If one could pump air into the soil no doubt coco-nuts like rice would grow in a swamp. Cacao is a permanent plant whose roots appear to be greatly benefited by operations designed to increase the air in the soil. For this reason, on the best cacao estates in Grenada forking about once in four years is carried on systematically. Our great dependence in the tropics on permanent crops and leguminous green dressings demands that careful thought be given to the subject of soil ventilation.

ERRATA.—In the note which appeared in the current volume of the *Agricultural News* (Vol. XIV, No. 338, p. 117) on the use of the Governor plum as a hedge-plant, the specific name of this plant given as *Flacourtia sepiaria* should be *F. Ramontchi.* Also in the article which appeared in the last issue of the *Agricultural News* (Vol. XIV, No. 351) describing the work of the Porto Rico Experiment Station, the coffee referred to as Colonaris should be correctly termed Columnaris.

SUGAR INDUSTRY.

Sugar Extension in the Philippines.—The Government in the Philippine Islands has recently passed a Sugar Central Act for financing schemes for establishing centrals in that group of islands. A Sugar Central Board is set up, and applications have to be made to it for loans as required. The first application appears to be for the sum of £150,000 for the establishment of a central at Lagonoy, Ambos Camarines. Under the terms of the above Act, the applicants have to invest a similar sum of their own in the undertaking. Meanwhile the high price of sugar is proving a great stimulus to the planting of sugar-cane in the Philippine Islands, as is also the existence of a large new central at Calamba which is offering great inducements of carriage facilities to get the farmers to grow a liberal acreage of canes.

Altogether the Philippines are making considerable efforts to establish the sugar industry in their islands on a large scale. The local Bureau of Agriculture is very active; *inter alia*, it is endeavouring to introduce and acclimatize a Hawaiian variety of cane. This variety has already been sufficiently propagated for cuttings to be supplied to the planters on several of the islands, and the results show such a considerable superiority over the native cane displaced that there is said to be great eagerness to get the new variety. The latter will, no doubt, ultimately largely replace the indigenous canes in all leading areas. (*International Sugar Journal.*)

Messrs. Gillespie Bros. & Co. write to say that during the fortnight preceding September 22, the market had been under the influence of the impending Budget, and speculation based on the likelihood of an increased duty has been sternly checked by Government restrictions from deliveries from bonded stores. The Budget, probably the most sensational ever known, was taken in the House of Commons yesterday afternoon, when taxes estimated to produce £272,000,000 were proposed. The following extract from the report of the Chancellor's speech will define the extent to which sugar is to share this enormous burden: 'The duty on sugar would be increased from 1*s.* 10*d.* to 9*s.* 4*d.* per cwt.; but the Sugar Commission would reduce its price by 2*s.* 6*d.* to 3*s.* per cwt. so that the price of sugar to the consumer would not be in proportion to the increase of the tax. The result of the tax would be to raise the price of sugar ½ d. per lb.'

Efforts to Establish a Bean Industry in St. Lucia.—In St. Lucia attempts are being made to encourage the cultivation of beans and peas by the introduction of a scheme for purchasing the produce on a profit-sharing basis. For some time interest has been aroused by the Imperial Department in various islands on the subject of increased bean cultivation, and the move under notice is one of the results.

The exact terms on which the Government will buy the beans are not yet fully matured, but it may be stated that a sum of money has been authorized by the Administrator for the purchase of beans at Réunion estate. It is gathered that the basis of the co-operative scheme will be as follows: First payment of 4c. per lb., and at the end of the year half the net profits will go to the vendors and half to the Government.

FRUIT PRODUCTS.

THE MAKING OF FRUIT PULP.

The commercial representative of this Department in Canada writes to enquire whether there is any possibility of interest being shown in the West Indies in the production of fruit pulps put up in 10lb., 20lb., or 50lb. tins for use by manufacturers of jams, jellies and confectionery. Our representative is of opinion that soursop, mammee apple, guava and any other fruit of these types might be got into larger consumption by this method.

The above suggestion appears to be worth considering. Oranges, of which a large number are at present wasted, might also be utilized in this way if a use for the pulp could be found in the jam and confectionery trades, as for example in making marmalade. Pine-apples could not be employed as they lose flavour on being heated, but even for pine-apple there might arise a demand.

The following article, reproduced with certain omissions from the *Journal of the Board of Agriculture* (England), explains how fruit pulps are made:—

As an article of food, fruit is generally used fresh, but there are various methods of preserving it, such as jam-making and fruit-bottling, which make it available when fresh fruit cannot be obtained, and which in seasons of heavy crops form a valuable means of preventing waste. Among such methods 'fruit pulping' is not so widely known as it might be, but specially merits attention on account of its simplicity. It consists in reducing the fruit to a state of pulp by heat, generally by means of steam. The treatment sterilizes the fruit, so that it may be kept under suitable conditions without decomposition for an indefinite period. The product is known as 'fruit pulp'. The process can be carried on by any grower who has on his premises an ordinary steam boiler.

Fruit pulp is chiefly used in jam-making. It is converted into jam where convenient to the manufacturer.

The essential requirements for the preparation of fruit pulp on a commercial scale are a steam boiler, and barrels, tins, drums, or jars, in which the pulp can be stored. The best qualities of pulp are stored in large stone jars, but these are expensive. The quickest and most convenient method of storage on a farm is to use casks. Casks which have contained wine or spirits are usually employed. They should be in good, sound condition, and preferably made of oak. Copper ladles and funnels are required for filling the casks.

In a jam factory, pulp is usually prepared in the steam-heated pans otherwise used for boiling jam, but in the absence of special jam making machinery the method here described may be adopted.

Three wooden vats, tubs, or half-barrels should be placed in a row in a position convenient for connexion with existing steam piping. Whilst the contents of one vat are being steamed, a second will be in process of filling, and a third being emptied, so that with a sufficient head of steam the process of pulping will proceed continuously. A coil of 1-inch copper piping is required. This should be pierced with not more than twenty $\frac{1}{8}$-inch holes. The coils should be placed in the vat or tub so as to reach to within a few inches of the bottom, and the pipe connecting it with the boiler should be fitted with a rapid coupling so that the coil may be quickly transferred from one vat to the next. For continuous working two such coils are required as it is not possible to insert a coil amongst the fruit after the vat has been filled. The vats should be provided with wooden covers to confine the steam whilst the steaming process is going on. With an 8 h.p. boiler working at a pressure of 45lb., three vats of 100 gallons capacity can be kept in fairly continuous use. Five cwt. of plums or apples may be cooked at a charge, and, if steam can be maintained, three charges may be put through per hour.

Steam is also required for scalding out and sterilizing the interior of the barrels before filling them with pulp.

The process of sterilization is completed by burning a rag dipped in melted sulphur within the bung hole, and the bung is then kept closed until the barrel is ready for filling.

The casks must be completely filled and bunged down whilst the pulp is boiling hot, and placed in a position where they can be kept undisturbed until the pulp is required for use. They should lie on their side with the bung uppermost, and if there is any sign of fermentation a small hole should be bored in the wooden bung and closed with a spiggot. The latter should be lifted daily until fermentation has ceased and the contents of the cask have settled down.

If the casks are subsequently moved, the same process of daily opening the same hole in the bung must be repeated.

If tins or jars, after previous scalding, are filled with boiling pulp and at once hermetically closed, the contents should keep indefinitely without fermentation. Tins used for pulp should be well lacquered inside.

PAPAIN: ITS PREPARATION AND DIGESTIVE PROPERTIES.

An important paper by Dr. D. S. Pratt, on the subject of papain, has recently appeared in the *Philippine Journal of Science* (Vol. X, Section A, No. 1, January 1915). The investigation with which the paper deals was undertaken for the purpose of comparing papain gums made in a variety of ways, and to ascertain whether it is possible to conserve the entire efficiency of fresh latex by employing proper methods for drying. In proceeding to do this it was felt that some standard method for analysis was required, and one which would give accurate results without calling for elaborate apparatus or laborious manipulation. The methods at present used seem to depend largely upon some sample of papain gum selected as a standard. The following scheme therefore for assaying papain was adopted. It has given satisfactory results in many hundreds of cases and may be recommended as simple, rapid, and accurate. It has the advantage of being carried out readily in any laboratory, and is all the information necessary for determining the quality of the sample:—

'Milk, as nearly as possible free from butter fat, is the most satisfactory material to employ as substrate. The various well-known brands of condensed skimmed milk possess reasonably constant composition, and are well suited to the purpose. I employed a 40-per cent. solution of sweetened condensed skimmed milk in the analyses recorded in this paper, not only because fresh skimmed milk was not procurable in Manila, but also for the reason that the canned milks keep well and are thus always available.

'The enzyme solution was prepared by dissolving 0·75 gram of powdered papain in 150 cubic centimetres of distilled water. Papain is not completely soluble in water, but by warming the mixture for thirty minutes in the thermostat at 40° the active principle is dissolved, and upon filtering a clear solution is obtained. Well-prepared gums give a colourless filtrate, which is slightly acid and shows a marked tendency to froth. The digestions were carried out in 150 c.c. Erlenmeyer flasks.

'The milk and water were always measured into the flasks and mixed by shaking. The enzyme solution was rapidly added from a burette, the contents were well mixed by a few vigorous shakes, and the flasks were at once placed in the thermostat. At the expiration of exactly thirty minutes they were removed in the same order, 20 c.c. of ice water added to each, and the flasks placed in melting ice to stop digestion.

'The contents of each flask were then successively washed into a 500 c.c. beaker, sufficient water being used to give approximately 75 c.c. of final volume. The undigested protein was then precipitated by slowly adding 0·5 c.c. of copper sulphate solution (60 grams per litre), followed by 0·5 c.c. of glacial acetic acid, the solution being vigorously stirred during precipitation.

'The contents of the beaker were now washed into 100 c.c. measuring cylinders and allowed to stand for a short time to permit the curd to settle, after which they were filtered through 11-centimetre ashless papers, which had been previously numbered, dried at 100°, and weighed. It frequently happens that filtration proceeds very slowly, in which case it is not advisable to wait until all the liquid has passed through, but is better to proceed with the washing. The curd is washed back into the cylinders with distilled water warmed to about 60°, and is thoroughly disintegrated by means of a rubber-tipped stirring rod. The sediment now settles readily, and the solutions filter rapidly. The undigested protein is washed three more times in this manner to remove sugars and soluble digestion products; gentle suction is applied to remove the surplus water, and the papers are dried to constant weight at 100°. No correction for the amount of papain used is necessary, as it is not precipitated by copper sulphate and acetic acid.

'The weight of protein digested by the various amounts of papain may be calculated from the blank in which no enzyme was used. The entire determination with the exception of drying may be made in from three to four hours, and duplicate analyses agree within about 2 per cent. The curves obtained in this manner show at a glance the relative proteolytic power possessed by samples of papain, as well as the rate at which digestion has proceeded with increasing amounts of enzyme. No antiseptic is necessary with such short periods of incubation.'

A considerable number of samples of papain obtained locally at Manila and imported from Ceylon, Mexico and the West Indies were examined by the foregoing method, and results were obtained which showed the percentage of total protein digested by increasing amounts of papain, and which also showed the marked differences existing in the proteolytic activity of the samples. Thus the amount of milk protein digested in thirty minutes at 40° by 1 milligramme of West Indian papain was found to exceed that digested under similar conditions by 100 milligrammes of a sample representing ordinary Ceylon papain.

Consideration is given next in the paper to various methods of preparing papain. The first experiment in this connexion had for its object the decision as to whether fresh latex is much more active than dried papain. It was found that fresh latex is considerably more active than dried papain from the Antilles, although both preparations are capable of digesting approximately the same amount of milk protein with relatively large amounts of enzymes present. In another experiment it was found that sun-dried papain is not necessarily less active than the fresh latex; but in this case it must be remembered that considerable care was given the sample to insure rapid drying, the exclusion of dust, etc. It was also dried promptly after collection. This is very important, as fermentation takes place rapidly in papain latex with the production of nauseating odours and the destruction of the enzyme. A satisfactory way of drying fresh latex is in vacuo over sulphuric acid. But on a large scale this would necessitate special machinery and present other difficulties.

Many enzymes may be purified and separated from extraneous material by precipitation with alcohol. This method is applicable to papain latex, and gives excellent results provided the action of the alcohol is limited to as short a time as possible. The sample of papain obtained by this treatment in the experiment was very active, 10 milligrammes being capable of digesting as much milk protein as 22 milligrammes of the Philippine sun-dried papain or 40 milligrammes of the West Indian product. This probably represents the most active papain that could be prepared commercially. Its manufacture by this method would necessitate a still for recovering the waste alcohol. The use of ether would hardly be practicable in tropical countries but could be employed by firms using papain, if desirable. Papain prepared in this manner is nearly soluble in water, giving a solution with small flocks of white insoluble material. The solution rapidly curdles milk, with the formation of a fine curd that quickly redissolves. This property of papain should make it of great value in preparing milk for infant feeding, as the formation of heavy indigestible curds in the stomach may thus be avoided.

In regard to the rate of digestion by papain, it was found that the reaction proceeded rapidly during the first ten minutes, and practically reached its maximum within an hour. It naturally varies with the surrounding physical conditions.

The question of digesting under various conditions was dealt with in a further series of experiments, particularly in relation to the papain digestion in acid solution. It was found that amounts of hydrochloric acid up to 0·06 per cent. have only a slight retarding action on the digestion of the gum. Increasing amounts from 0·06 to 0·13 per cent. acid very greatly reduce the activity of the enzyme, although any further increase up to 0·20 per cent. causes practically no change. A sharply defined range of acidity thus reduces the digestion to one-half its former value. In regard to hydrocyanic acid it was found that this increased the percentage of milk protein digested by papain. The presence of 0·02 per cent. acid was sufficient to give the maximum effect, higher concentrations causing no further increase. These effects of hydrocyanic acid and hydrochloric acid are very remarkable.

Digestion at various temperatures was the next aspect to receive attention, and it was found that papain shows a remarkable activity at low temperatures. There appears to be very little difference in the rate of digestion in the neighbourhood of 40° to 50°. The digestion at 70° shows that the activity in the presence of large amounts of enzymes is not greatly weakened, but with decreasing percentages of gum the loss becomes more marked. Papain exhibits a rather remarkable resistance to heat, but if a solution is rapidly warmed to 100° and allowed to boil five seconds, and is immediately cooled with ice, it no longer shows any proteolytic activity.

In regard to standard evaluation of papain, it is suggested that the average of six determinations carried out in a manner previously described in connexion with methods of analysis, using 25 c.c. of milk, 23 c.c. of distilled water, and 2 c.c. of a filtered solution representing 10 milligrammes of papain digested for thirty minutes at 40°, be accepted as the standard, and that the proteolytic activity of the gum be designated by the ratio obtained of 1 part of papain to the digested protein.

COTTON.

WEST INDIAN COTTON.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the weeks ending September 25 and October 2, respectively, is as follows:—

The total receipts of the new crop up to date are only 11 bales. They are not being offered for sale, as the Factors have decided to put no cotton on the market until there is some accumulation of stock. Consequently the market will not open until the early part of next month.

The receipts for the week were 37 bales, making in all to date only 60 bales. The Factors are not offering this limited snpply, preferring to wait until there is sufficient accumulation to admit of their being able to judge better the quality.

British Cotton Growing Association.—The one hundred and thirty-ninth meeting of the Council of the British Cotton Growing Association was held at the Offices, 15 Cross Street, Manchester, on Tuesday September 7. The President (The Rt. Hon. The Earl of Derby, K.G.) occupied the Chair.

WEST AFRICA. Considerable quantities of cotton seed have been distributed in Lagos for planting for the new crop, and the seed is being freely taken by the native farmers, and on the whole the people do not appear to be discouraged by the reduced prices which are being paid for cotton, but are sowing as much as ever. The rainfall has been more satisfactory than for some years, and there is reason to anticipate a large crop next season.

The purchases of cotton in Lagos to date amount to 5,856 bales, as compared with 13,415 bales for the same period of last year, and 13,557 bales for 1913.

The purchases in Northern Nigeria to the end of July were 437 bales, against 505 bales for last year.

It has been decided to close down the operations in the Gold Coast and at Illushi (Southern Nigeria), but it is proposed to make arrangements for the Labolabo Ginnery to be kept open during the cotton season for the benefit of those planters who may continue to grow cotton.

NYASALAND. The buying prices for the new native cotton crop have been fixed after careful deliberation between the Director of Agriculture and the Association's representative. Slight reductions in price have had to be effected in certain districts, but these were inevitable in the present condition of the cotton market and the Governor is satisfied that they are the most liberal terms which could have been offered by buyers. The picking of the new crop has commenced, and it is expected that the crop will be an average one.

WEST INDIES. Arrangements have been made for guaranteeing a fixed price for the 1915-16 crop of the West Indian Sea Island Cotton, and should any cotton prove to be superior to the fixed standard, a relatively higher price will be paid, and lower prices where the cotton is below the standard. It is hoped that these arrangements will encourage the Planters in the West Indies to continue cotton cultivation.

SMOKING THE MANGO.

In connexion with an enquiry made by this Department at Kew concerning the practice of 'smoking' pine-apples in the Azores, which has been found to hasten the time of flowering of that plant (see *Agricultural News*, Vol. XIII, No. 320, p. 245), the Assistant Director of Kew (Mr. A. W. Hill, M.A., F.L.S.) has forwarded to this Office a copy of an interesting account appearing in No. 104 of the publications of the United States Office of Foreign Seed and Plant Importation, on the subject of the effect of smoke on the mango.

Mr. Henry H. Boyle on his late visit to America was requested to write a full account of a very interesting practice of the Filipinos which they believe ensures a good crop of mangoes. In his letter of March 6, 1915, he gives the following description of 'The smoking of mangos': A fire is built under the tree, then a bamboo shield is placed so that the smoke from the fire is directed upward through the branches of the tree. In some cases a smoke stack is made out of bamboo and placed under the tree. The fire is built under the hood. This is by far the most effective method of having the smoke spread through the branches of the tree. The natives of Cavite Province start to smoke the mango trees the first part of August and continue until the flowers have been pollinated and the fruit set. The time consumed in smoking is about one month. Weeds, leaves and rubbish are used for fuel. Care should be taken not to let the materials blaze. This can be prevented by placing rice chaff, banana leaves or sawdust upon the pile to be burned. The object of the smoking is, according to the natives, to cause the tree to produce flowers earlier and to have the fruit ripen earlier. It also helps to dry the flowers which have become wet from the dew and materially helps to keep down the harmful insects and fungus. The smoking is stopped when the fruit is the size of a marble. Nicking is performed when the tree reaches the age of six or seven years. The time selected is about the first part of November, which is the dry period in the province of Cavite. The tree is first nicked from the ground upward as far on the trunk as it is possible to reach, or to the first branch. Care should be taken not to injure the cambium layer to too great an extent. The smoking is performed upon trees that have not been *nicked* or *taga* as they say in Tagalog. The nicked or slashed trees after smoking will produce fruits three months earlier than those that have not been nicked or smoked. This nicking is done by a sharp bolo. When I first saw the nicking and smoking stunt used on mango trees, I was of the opinion that it was more injurious than beneficial, but now after three years of observation I can readily see that it is a wonderful help to trees raised from seeds. They fruit and fruit earlier than those not treated in the manner described, and I have never seen any bad results caused by the nicking or smoking. This is saying a good deal as I have seen mango trees in every large island of the Philippines, treated in the manner described. There is another matter, regarding mangoes, which I spoke to you about when last in Washington: namely the method employed by the natives for keeping mangoes six months. It is as follows: A kerosene tin which holds 5 gallons is used as the receptacle. An equal amount of second grade molasses and sawdust is mixed or as much molasses as the sawdust will absorb is used. The quantity of the above material used depends upon the amount of mangoes placed in the tin. It is however, necessary to have the mangoes completely immersed. The tin is then made air tight by soldering. The second grade molasses is cheap

here, due to the large number of sugar mills, so the expense thus incurred is very little. I have arranged to have one tin of the first mangoes packed in this manner sent to you so that you may see if the method is O. K.

PRODUCTION AND SELECTION OF COCO-NUTS IN THE SEYCHELLES.

The following extracts are taken from the interesting report by the Curator of the Seychelles Botanic Gardens on the Agriculture and Crown lands of the Colony for 1914:—

As anticipated in my report for last year, the rise in the output of coco-nuts is proceeding by leaps and bounds. The crop for the year under review amounts to 31,000,000 nuts, being greater by 5,000,000 nuts than the crop for the preceding year. This result bears testimony to the greater attention which is paid by planters to their coco-nut plantations. The crop will continue to increase for a long time, as during the last five years nearly 100,000 more coco-nut trees were set out and these trees will be bearing in five years. The present increase is solely due to the plantations having been cleaned regularly and freed of the fungus and beetle diseases to some extent. The leading planters are also taking the trouble to manure with compost, seaweeds, cowdung, etc., and the results already obtained will gradually induce them to use guano, green manures and chemical fertilizers. A good deal of subsoiling by hand has also been done, but unfortunately the use of explosives for the breaking of the hardpan a few inches underground has not been attempted owing to the difficulty of getting explosives at a cheap price. The practice of digging trenches in which all the refuse is thrown in, is more and more largely adopted on level land.

The question of selection of varieties of coco-nuts is not lost sight of by a few planters. This selection depends however on so many factors that little progress in the right direction has been made. One of these factors unobserved hitherto is the number of female flowers produced by the different varieties, which is very variable. Mr. Petch, of Ceylon, has called in December 1913 the attention of planters to this subject. The flowerings do not take place regularly in Seychelles and this accounts for the irregularity of the crop, which generally reaches a maximum in July and drops to a minimum in February. The number of female flowers per bunch does not vary on the same tree, but during the months of minimum crop there are much less inflorescences produced by the tree, notwithstanding the weather conditions, and many of these contain no female flower at all. It is from trees producing the greatest number of female flowers per bunch and per annum that seed nuts should be selected. Admitting that the number of ripe nuts per tree is a sufficient guide for selection, there is however another factor, i. e., the fall of immature nuts, which has to be taken into consideration and which seems also to be of a character proper to some kinds. Many trees which drop their nuts before maturity seem to recover from this defect during the months of maximun production and should not be necessarily discarded in the work of selection. From a few observations made when the trees are young and in their third year of blossoming, the natural tendency of the trees can be well determined, and there is no need to wait till they are old and produce their full crop of ripe nuts, to carry on the work of selection. For trees which flower after their seventh year of growth the question of gaining time in the work of selection is to be seriously considered.

VANILLA GROWING IN THE SEYCHELLES.

The Annual Report on Agriculture and Crown Lands in the Colony of Seychelles for the year 1914, contains interesting particulars in connexion with experiments carried out in the vanilla industry there. The shortage in 1914 is attributed to unfavourable weather conditions. August was the only month during which a small rainfall favoured the flowering, but the spell of dry weather was too short, and the rainfall preceding and succeeding it was to heavy to allow the vines to flower under normal conditions. This shows how difficult it is for vanilla to flower in wet countries like Seychelles, and on what a small factor the vanilla crop depends.

It is noteworthy that included in the series of experimental plots on the manuring of vanilla was that of mulching. These consisted of mulching with leguminous weeds and twigs, mulching with ordinary grass, with ordinary grass plus lime, mulching with ordinary grass plus phosphate (Seychelles rock guano), with ordinary grass, plus complete soluble fertilizer (Truffaut), with ordinary grass plus potash in the form of potassium sulphate, with ordinary grass plus potash in the form of potassium chloride, with ordinary grass plus nitrogen in the form of ammonium nitrate, with ordinary grass plus nitrogen in the form of nitrate of soda, with leguminous weeds and twigs plus complete fertilizer (Biogine Truffaut).

A separate experiment was also made in connexion with the use of certain shrubs as props in vanilla culture. In this plot the props used were cuttings of *Gliricidia maculata*, while in the other plots the usual Pignon d'Inde (*Jatropha curcas*) props were used. The experiment was tried to determine the influence of the newly introduced shrub as a vanilla support. The conclusion was reached that the rapid growth of this leguminous shrub, its resistance to disease and to adverse conditions of soil and climate, and the ease with which the cuttings strike roots in all classes of soil, render it an idea one for vanilla culture. So far it has been successful, its abundant foliage being at least ten times more vigorous than that of the Pignon d'Inde without being too heavy.

The following props are reported to have been uprooted after nine months' growth to examine the root system of each and consider their suitability as props for vanilla, with the results stated:—

1. Bois chandelle (*Dracæna angustifolia*) from cuttings: 7 feet high with two small branches giving insufficient shade, four roots at right angles to each other 7 feet long but provided with very few rootlets.

2. Pignon d'Inde (*Jatropha curcas*) from cuttings: 7½ feet high with three branches, three big roots sharply tapering with fine extremities and five very small roots.

3. *Gliricidia maculata* from cuttings: 12 feet high with twelve branches, tap roots 3 feet long together with fourteen roots placed like the tubers of a cassava plant, the longest measuring 5 feet and the shortest 1 foot. This powerful root system accounts for the rapidity of growth of this plant and one may hope that the deep roots deprived of a network of rootless will not interfere too much with the roots of vanilla.

4. Cashew nut (*Anacardium occidentale*) from seeds: 5 feet high with three branches, one slender tap root and a few rootlets. The root system is weak as compared with that of the other plants.

The above results would appear to justify the favourable opinion entertained in regard to *Gliricidia maculata*. Experiments with this shrub might be made in those islands in the West Indies in which Vanilla growing is carried on.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents' and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with various aspects of the subject of soil ventilation: 'Air, as well as water, is required by the roots of plants'.

Under the general heading of Fruit Products will be found a suggestive article on the making of fruit pulp. Another gives valuable information concerning papain.

Notes on coco-nut selection, vanilla experiments and the smoking of the mango appear in this issue.

Insect Notes contain original observations on pests of Lima beans in St. Vincent. Fungus Notes concern the spraying of ground nuts in Montserrat.

Lime Cultivation in British Guiana.

The private enterprise shown in the cultivation of limes has not been inconsiderable in British Guiana, and the appearance of a series of articles on the practical side of the subject in the *Journal of the Board of Agriculture* of that Colony would appear to indicate that the Government is anxious to encourage and assist as much as possible. The first of the articles, which have been prepared by Professor Harrison and Mr. C. K. Bancroft. deals with the botany of the plant, its soil and climatic requirements, the preparation of the land, seed beds, planting, inter-cultivation and pruning, and embodies sound information that will prove useful to such planters as are unacquainted with recent literature connected with Dominica and St. Lucia, which has been freely drawn upon by the authors. Some of the information, however, is of local application, and is therefore relatively new. Lime growers in Dominica and St. Lucia may be interested, for instance, to read the writers' views as to cultivation and manuring. The time of planting and the trees used as wind-breaks are also, as one would expect, peculiar to the conditions of British Guiana.

Export Tax on Sugar in Antigua.

We learn from the Antigua *Sun* for October 9, that at a meeting of the Legislative Council held recently in that Colony, His Excellency the Governor, Sir H. Hesketh Bell, delivered an address on the financial needs of the Presidency consequent on the War, which has caused a serious shrinkage in the import trade and in the Government revenue, but on the other hand, has largely increased the value of the principal exports. Additional revenue was necessary, and it was pointed out that the only source from which revenue could be obtained was to be found in the imposition of a tax on sugar and molasses. This impost will assume the character of a special war tax, which His Excellency proposed should affect the crop that will be reaped during 1916 only. The sum desired to be raised was an amount not less than £6,000. and it was recommended that the following export taxes should be levied from January to December 31, 1916; viz. on crystal sugar 8*s*. 4*d*. per ton, on muscovado 4*s*. 2*d*. per ton, on crystal molasses 1*s*. 3*d*. per puncheon, and on muscovado molasses 2*s*. 1*d*. per puucheon. This was unanimously agreed to, and a Bill entitled 'An Ordinance for the Imposition of a Duty on the Exports of Sugar and Molasses' as mentioned, was subsequently passed through all its stages.

Other colonies such as British Guiana, Barbados, and St. Lucia have felt the necessity of imposing export duties of different amounts upon sugar at this critical time. This course is held to be warranted by the fact that the price of sugar has increased in a marked degree as the outcome of the War: these taxes are therefore levied upon increments in values.

The Co-operative Credit Movement in Ceylon.

From Mr. R. N. Lyne, Director of Agriculture in Ceylon and Registrar for the Societies, we have received a copy of a Report on the Co-operative Credit Movement for 1914-15. In the introduction it is stated that the report is a chronicle of steady progress. The number of societies has increased by nineteen, namely from thirty-five to fifty-four; the total membership by 2,030, that is, from 1,820 to 3,850; and the paid-up capital by Rs. 10,630, standing now at Rs. 18,832 as against Rs. 8,202 in 1913-14.

Of the fifty-four societies, fourteen have been registered with limited liability (mutual co-operation as in St. Vincent); the rest are unlimited. In almost every case of limited liability it has been so arranged that the liability of a member is limited to twice or more the face value of the share or shares he has taken.

Mr. Lyne says that in districts where co-operative credit has not yet proved a success, the only barrier between the people and this emancipating measure of co-operation is ignorance of its true nature. The efforts of the educated classes are required to breakdown the barrier in those districts where it still exists.

Another Onion Growers' Association.

Mr. C. A. Gomez, Acting Curator of the Experiment Station, Tortola, Virgin Islands, has notified this Office that a Tortola Onion Growers' Association has been definitely inaugurated. The planters, it is said, have taken up the scheme with great interest and every day there are new applications for membership. Judging by the quantity of plants ordered by intending growers, it would appear that the new organization is likely to be a success. Efforts are being made to establish an extension of the Association in the neighbouring island of Virgin Gorda.

This makes the third onion growers' association to be formed in the Leeward Islands. The Antigua society was established in 1913 and its success, especially during the past year (an account of which appeared in the last issue of this journal), stimulated the formation recently of a similar but smaller association in Montserrat. The co-operative sale of onions will soon become a special feature of the Leeward Islands.

Vitamines in Lime Juice.

Vitamines are complex substances of indefinitely known composition, which in minute quantities regulate the processes of life. Their action is supposed to be connected with the production of some of the essential hormones, internal secretions, enzymes, etc., upon which metabolism depends. Many physiological diseases like beri-beri, pellagra, scurvy, and rickets are attributable to the absence in the diet of a certain specific vitamine.

In connexion with scurvy, the value of lime juice as a preventive and remedy is well known. The value of this substance lies in the fact that it apparently contains a vitamine. Dr. H. W. Bywaters, in *Science Progress* (October 1914) says:—

'The exact nature of the anti-scorbutic vitamine or vitamines has not yet been established. The experimental study of scurvy has shown conclusively that they are not necessarily potassium salts, as suggested by Garrod, nor are they effective because of their acid-neutralising properties, as demanded by Sir Almroth Wright's theory of acid intoxication. It would appear at first sight that there must be several different anti-scorbutic vitamines because of the variable stability of the curative principle in different foodstuffs. As a rule, heating the food material—milk, for example—to 100°C. is sufficient to destroy the anti-scorbutic vitamine contained in it. But lime juice—one of the most efficient anti-scorbutics—may be heated for an hour at 110° C. without affecting the curative power. Preserved vegetables are useless as preventives of scurvy, but lime juice retains its power for years. It is not impossible, however, that the real agent is identical in each case, the environment being really responsible for the observed differences in the behaviour under the influence of heat and other conditions. The presence of the 7 per cent. citric acid in lime juice, for example, may confer a stability on the active principle which is not apparent in the slightly alkaline milk, where, it will be noted, simple sterilization is sufficient to destroy it.'

Molasses as a Substitute for Oats.

The experience of Dr. Stoute, V.S., of Barbados, is that many horses work as well when fed on molasses as they do when fed on oats. In the case of his own horse this has been proved. The following is the ration which Dr. Stoute employs for a moderately sized animal:—

Molasses	4 pints
Pollard	8 „
Oil meal	1 pint.

If chaff agrees with a horse, some may be mixed with the above ingredients.

In substituting molasses for oats, the change should be made gradually and only vacuum pan molasses, which has been boiled once, should be used.

The animal receiving the above ration does 12 to 16 miles a day

It may be noted that pollards contains 2 to 3 per cent. more albuminoids than oats so that the loss of nitrogen by the substitution of the molasses for oats is made up by this, and the circumstance that the oil meal (presumably cotton) will contain over 10 per cent. more albuminoids.

INSECT NOTES.

INSECT PESTS OF LIMA BEANS IN ST. VINCENT.

The following notes by Mr. S. C. Harland, B.Sc., Assistant Agricultural Superintendent, have been forwarded by the Superintendent to this Office for publication. The observations contained in the notes are important, in view of the suggested extension of the area under Lima beans in St. Vincent and other colonies. It would appear that the Cryptorhynchus borer referred to may be found to be troublesome, but the remaining pests do not seem to be very serious:—

During the past four months a special study has been made, at the St. Vincent Experiment Station, of the insect pests of Lima beans. It was considered of the utmost importance that before a large area was planted in this crop, as exact a knowledge as possible should be obtained of the insects with which planters may have to contend. It was thought advisable to devote some attention to the insect pests of allied indigenous species, since amongst these might possibly be found the wild food-plant of some dangerous pest of Lima beans. It will be seen that some success has attended this line of work.

A large number of insects are capable of attacking Lima beans, but the following appear to be the most important:—

(1) An undetermined Cryptorhynchus borer.
(2) The bean leaf-roller (*Eudamus proteus*, L.).
(3) An undetermined leaf blotch-miner.
(4) The Lima bean caterpillar.

The Cryptorhynchus Borer.

The writer's attention was first called to this borer in May 1915, at the Experiment Station. It was noticed during the examination of some pole Lima beans that many plants possessed leaves of an unhealthy yellow colour, as if attacked by wilt. Further examination disclosed the fact that the base of the stem and many of the nodes were abnormally swollen, that the stem was tunnelled, and that small white grubs were present either in the nodes themselves or in the connecting tunnels. Several weevils, very similar to the cassava weevil, but smaller, were at the same time observed near the base of the stem. The larvae obtained from the plants produced adults identical in appearance with these.

PREVIOUS REFERENCES. A short note on the borer appears in the *Agricultural News*, Vol. XIV, No. 344, p. 218). Previous to this, the only reference to it which has hitherto appeared in the agricultural literature of the West Indies is to be found in the Annual Report of the Department of Agriculture of St. Vincent for 1910, p. 22. It is there mentioned as a pest of Jerusalem pea (*Phaseolus trinervis*) by Mr. W. H. Patterson, the then Resident Master at the Agricultural School, in the following terms: 'When the plants should have flowered, the leaves and stems turned yellow, having the appearance of suffering from drought, though ample moisture was present. This was due to the attack of an undetermined weevil, the larvae of which bore into and tunnel the stems.' The writer goes on to say that the attack was so serious that no seeds were obtained from $\frac{1}{4}$-acre, and that efforts to find other food plants were without success.

LIFE-HISTORY. A complete life-history of the weevil has not been worked out, but certain information has come to light which may prove helpful in combating it, should occasion arise. The duration of the larval and pupal periods cannot be more than two or three weeks, since adults have been reared from plants less than five weeks old, and the pupal period has been determined with certainty to last from five to seven days only.

HABITS OF LARVAE. At the beginning of the attack one or two larvae are found in the lowest node, which, as a result of irritation, becomes greatly enlarged. At this stage, the whole larval period is passed in the node and it is only later that the stem becomes tunnelled. The eggs are laid in the node, just under the epidermis. If the plants are attacked when young they are either completely killed, or fail to make further growth. Older plants seem to adapt themselves somewhat to the presence of the weevil and do not suffer so much. The base of the stem may become enormously swollen. A single plant of Rounceval pea (*Vigna unguiculata*) was 5 inches in circumference at this portion, which was completely riddled with borings and contained twenty-two specimens of the weevil in all stages of development.

THE PUPAL PERIOD. When fully grown, the larva is about 6·5 mm. long by 3·5 mm. broad. It pupates *in situ*, forming a rough pupa-case of the dead fibres of the stem. When the adult emerges after five or six days, it proceeds to bite its way out.

HABITS OF ADULTS. The adults, as well as the larvae, feed on the host plant, eating the young shoots and stem. Several weevils were introduced into an insectary where a young seedling was growing. They simulated death for a short time, but soon made for the stem. Some remained there at the base near the ground; others buried themselves near by. At the end of the second day it was observed that part of the stem had been eaten just below the cotyledons, and that sap was oozing from it in many places. Subsequently it was established that the weevils feed only during the night, being quiescent in the day. The seedling did not recover from the damage inflicted on it by the weevils.

The adult weevil probably lives for a considerable time; some were kept alive in captivity for more than a month.

HOST PLANTS. The following cultivated plants are attacked more or less severely: Lima bean (*Phaseolus lunatus*), cowpea (*Vigna catjang*, var.), and Rounceval pea, Jerusalem pea (*Phaseolus trinervis*), haricot or French bean (*Phaseolus vulgaris*).

As the pest seemed to confine itself to the genera Phaseolus and Vigna, careful search was made of the wild species of these genera found in St. Vincent. It was discovered that the common leguminous weed, *Phaseolus semierectus*, and the less common *Vigna luteola* are almost invariably attacked by the borer, which, however, does not appear to check their growth to any extent.

Other species of these genera recorded from St. Vincent are as follows: *P. adenanthus*, *V. sinensis*, *V. vexillata*. These have not been examined.

DISTRIBUTION. The Cryptorhynchus borer is found in all parts of St. Vincent, and in Bequia; it does not appear to be present in Union Island, although *Phaseolus semierectus* is exceedingly abundant.

CONTROL. Should the cultivation of Lima beans be taken up in St. Vincent, the best means of control would appear to be in the uprooting and destruction of all plants of *Phaseolus semierectus* and *Vigna luteola* adjacent to the fields. In view of the habit of the weevil of remaining at or near the base of the stem, hand collecting might possibly meet

with success. It may be pointed out, however, that when on the ground, the weevil is exceedingly difficult to detect on account of its protective colouration. Rotation of crops should certainly be practised, and all old bean stalks should be pulled up and burnt, or put in the cattle pens, in order that the larvae may have no opportunity of completing their life-history.

This pest is undoubtedly one to be reckoned with seriously and it may prove very difficult of control. Cowpeas mature in a comparatively short time, and thus escape serious damage.

(*To be continued.*)

LOCUSTS IN DEMERARA.

In the *Agricultural News* for June 19, 1915, an article appeared on the subject of locusts in Trinidad, a severe outbreak of which occurred in the San Fernando district last May and June. Papers that have recently come to hand indicate that a plague has now broken out in Demerara. According to the *Daily Argosy* of October 2, Mr. G. E. Bodkin, Government Economic Biologist, has paid a visit to the Corentyne Coast, Berbice, with the object of investigating and controlling the outbreak. It appears from the report that great difficulty was experienced in carrying out the necessary measures owing to the indifference and laziness and, to some extent, the suspicion of the coolie inhabitants. When after some difficulty a gang had been procured it was possible to begin to collect the locusts in kerosene tins, and to burn them in deep pits with kerosene oil.

Towards the end of the report are reproduced the following notes extracted from the *Bulletin of the Department of Agriculture, Trinidad and Tabago*, on the subject of locusts flights in that colony:—

'From time to time large flights of this locust come over to Trinidad from the mainland of Venezula. Its particular food-plants appear to be banana leaves, coco-nut palm leaves, Indian corn, cassava, peas and sugar-cane. Cacao was not touched.

'Control measures consist in digging up the eggs, and also in the destruction of the young hoppers by driving them into trenches and there burning them with kerosene oil. The use of arsenicals is also advocated.'

Mr. Bodkin goes on to say that the Trinidad locusts present infinitely greater danger to cultivators than the species occurring at the present time in Berbice. The name of the species is not given, but it is apparently quite distinct from *Schistocerca paranensis*, the form which occurs in Trinidad. The latter is said to be smaller, and it moves in vast swarms according to the habits of a true migratory locust. The species of locust that damaged cultivations in 1886 was, as far as can be ascertained from the incomplete records in the British Guiana museums, *Acridium vicarium*. The sudden appearance of *Schistocerca paranensis* in Demerara is well within the bounds of possibility.

In Zanzibar the principal crop is cloves. The average yield per annum from a plantation of 3,000 trees of about sixty years old, owned and managed by Europeans, is 8 lb. per tree: ninety-eight trees are planted to the acre; the price varies according to the size of the crop. The price of recent years has varied from Rs. 8-8-0 to 14-5-0 per frasla of 35lb. The Government levies a duty of 22 per cent. on all cloves exported. Coco-nut ranks next in importance to clove. It is estimated that there are about 45,000 acres under coco-nuts in the two islands.

FIXATION OF NITROGEN IN INDIAN SOILS.

The quantity of nitrogen, says Dr. Hutchinson (Bacteriologist to the Imperial Department of Agriculture in India), which leaves that country in the form of agricultural products is infinitely greater than the amount returned to the soil either in the form of manure or leguminous plants. It is very important therefore to encourage the activities of Azotobacter and Clostridium organisms which are capable of nitrogen fixation from the atmosphere while living a free life in the soil. The following conclusions were arrived at by Mr. J. H. Walton, B.A., B.Sc., Supernumerary Bacteriologist, in regard to azotobacter and nitrogen fixation in Indian soils, and the paper to which they refer is published in the Memoirs of the Department, (Bacteriological Series, Vol. I, No. 4).—

The nitrogen-fixing power of Azotobacter in cultures inoculated with Pusa soil compares very favourably with that observed by other investigators.

There is a well marked seasonal variation in the nitrogen fixation in cultures inoculated with soil.

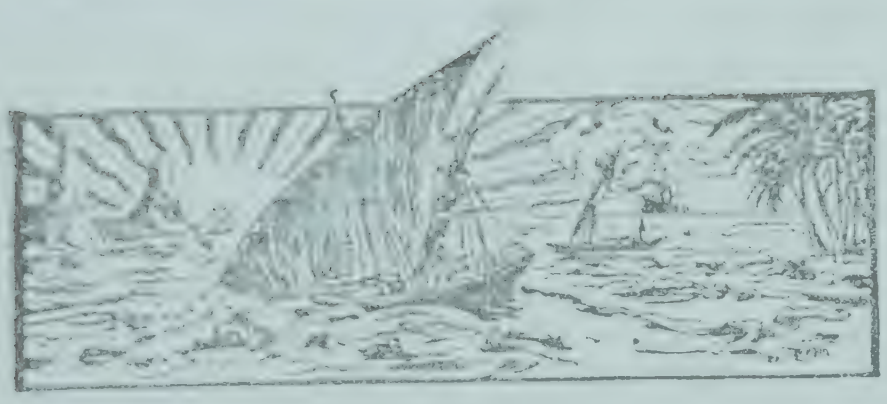
Pure cultures of Azotobacter isolated from different soils vary in nitrogen-fixing power and in morphological and cultural characters. These morphological and cultural characters are constant in any particular variety.

Black pigment occurred only in impure cultures.

Nitrogen fixation in soil is increased by cultivation and the addition of suitable carbohydrate material. We may conclude that proper soil management shcuild include the provision of conditions favourable to the physiological activity of Azotobacter, namely aeration, the presence of lime, and the presence of available carbohydrate food. The increased nitrogen fixation observed as resulting from the addition of humus, and the experimental demonstration by Koch that cellulose may be acted on by micro-organisms in the soil so as to make it available as carbohydrate food for Azotobacter, emphasize the importance of such agricultural operations as tend to maintain the supply of organic matter in the soil.

The study of the physiological effect of rations from single plant sources upon cows subjected to the strain of reproduction, carried on by the Departments of Agricultural Chemistry and Animal Husbandry for the past seven years, has narrowed itself down to a detailed study of the corn and wheat plants on reproduction. In all of the work a chemically balanced ration from the wheat plant and its products has never produced normal calves, while a ration from the corn plant has always produced vigorous offspring.

In view of theories held by various investigators it was thought possible that the injurious effects of the ration restricted to the wheat plant might be due to the prepond-erance in the mineral matter of acids over alkalies or to the large amount of magnesium compared with calcium. However, it has been impossible to correct the bad effects of the ration by the addition of various alkaline salts. It has also been found that disturbing the balance of mineral matter in the corn ration by the addition of various salts, or even rendering the ration acid by the use of mineral acids, did not lead to injurious results. (*Wisconsin Bulletin*, No. 250.)



GLEANINGS.

Amongst the plants introduced into the colony of Seychelles in 1914 were the Cohune Nut Palm (*Attalea Cohune*) from Trinidad, and the Barbados cherry (*Malpighia glabra* from Barbados.

In the *Leeward Islands Gazette* for September 23, 1915, a notification appears to the effect that until further orders the landing of any animals in Montserrat coming from the island of Grenada is prohibited on account of the existence of anthrax in the latter colony.

According to the *International Sugar Journal*, the cultivation of sugar is being extended in all sorts of unexpected places including Portugese West Africa, where a company has recently cleared 3,200 acres for cane. A mill capable of handling 7,000 tons of cane has been erected.

The Mirrlees Watson Company, Limited, have furnished this Office with an illustrated catalogue describing the Ramsay Patent Maceration Scraper and Intermediate Carrier for Multiple Crushing Mills. It is stated that the appliance is now in use in a number of Hawaiian factories and is giving most satisfactory results.

According to a reference in the *Experiment Station Record* (Vol. XXXIII, No. 2) the sugar and potash contents of beet follow closely the quantities of potash supplied with little reference to the quantities of sodium that may be added in conjunction. It is believed, however, that the presence of sodium increases the effectiveness of the potash.

The influence of position in the pod upon the weight of the bean seeds is referred in the *Experiment Station Record* (Vol. XXXII, No. 6). It is believed that the percentage of ovules which develop into seeds increases from the base toward the stigmatic end of the pod. In small pods the rate of increase may be fairly regular, but in larger pods it falls off toward the stigmatic end, where the fecundity may be even lower than it is a little farther down the pod.

A note is made in the *Experiment Station Record* (Vol. XXXII, No. 6) of a quarter of beef which was kept frozen for eighteen years. At the end of that time it showed no indication of putrification. The fibres of the meat on microscopical examination appeared normal, and the meat was consumed without any signs of digestive disturbance. It is observed that perhaps one reason why this meat maintained its good condition was that it had not been kept in a chamber in and out of which other beef was passing.

In connexion with the importation of pedigree pigs into Demerara by the Department of Science and Agriculture, the *Daily Argosy* mentions the fact that two farrows have been obtained from the Berkshire sows, while the Tamworth sows were expected to farrow in the course of the next ten days or fortnight. It is stated that more applications from farmers have been received for the Berkshire piglets than can be supplied, and it might be possible in future to arrange for the applications being supplied on the basis of a system of rotation.

In an article entitled 'Musk and Ambergris' in the *Perfumery and Essential Oil Record* for July 1915, it is stated that in the days of Louis XIV, every table contained 'Pomade à la Frangipane' or 'Esprit de Frangipane'. During recent years Frangipane as a perfume has come into use again although perfumers differs as to its exact preparation. In the same article reference is made to Columbus's first visit to Antigua, where the air was 'fragrant with perfume'. Upon landing they found vast quantities of *Plumeria alba* in full bloom, yielding what has often been called 'the eternal perfume'.

In a lecture delivered by Mr. R. D. Anstead, M.A., to the United Planters' Association of Southern India, some interesting figures are given in regard to the potash content of certain plants used as green dressings and as mulches. *Tephrosia purpurea* contains 24 per cent. potash in its ash, while Albizzia prunings contain 22·8, Casuarina only 4·9 while *Leucaena glauca*, 25·1. It is interesting to note that coco-nut husk contains as much as 47·0 per cent. of potash in its ash, whereas the shell contains 26·5 per cent. and the leaves only 1·1 per cent. The lecture referred to is published in the *Planters' Chronicle* for August 28, 1915.

In a letter received from Messrs. Pickford & Black Ltd., of Halifax, N. S., it is stated that the West India Court at the recent Canadian National Exhibition was the smallest for some years past, but it was the general opinion that Jamaica, the only participant, provided the most attractive and representative exhibit it has had for the last four years. The *Toronto World* for September 4, 1915, calls attention to the Handbook distributed by the Imperial Department of Agriculture for the West Indies entitled The West Indies in Canada. This, it is pointed out, contains much information concerning the West Indian Islands and their products.

In the issue of this Journal for January 4, 1913, attention was called to the gradual disappearance of the black witch or tick bird (*Crotophaga ani*) from certain islands in the West Indies, and also to its complete absence in others. Mr. A. J. Brooks, Agricultural Superintendent, St. Lucia, records the fact that a specimen of the bird has recently taken up its abode in the Experiment Station at Réunion. This bird was exceedingly common in St. Lucia about fifteen years ago, but has been practically exterminated by the mongoose. Owing to their beneficial nature in connexion with the destruction of insect pests, an increase in the number of these useful birds is to be encouraged.

THE CYCLONIC DISTURBANCE OF AUGUST 10.

It may be of interest to record in this Journal the nature of the cyclonic disturbance that passed through the Windward and Leeward Islands on Tuesday, August 10, 1915.

By reference to the accompanying map, which gives in diagrammatic form the general conditions believed to exist on the afternoon of August 10, the general course of events can be appreciated. The cyclone, which was of large area, apparently originated south-west of Dominica and its centre passed over that island. The dotted or right-hand circle of the diagram represent the disturbance soon after its formation, before it had attained a high degree of intensity. As it proceeded on its westward path the intensity increased. Luckily it originated sufficiently near to Dominica to leave insufficient time for any great intensity to be reached before passing over that island: otherwise the damage inflicted would have been very much greater than it was. Travelling westward the storm was in full force by the time it reached Jamaica, and apparently maintained its intensity until it penetrated the Southern States of America causing much damage at Galveston on the coast of Florida. In Louisiana it is reported that considerable damage was done especially to sugar factories, as far west as Franklin.

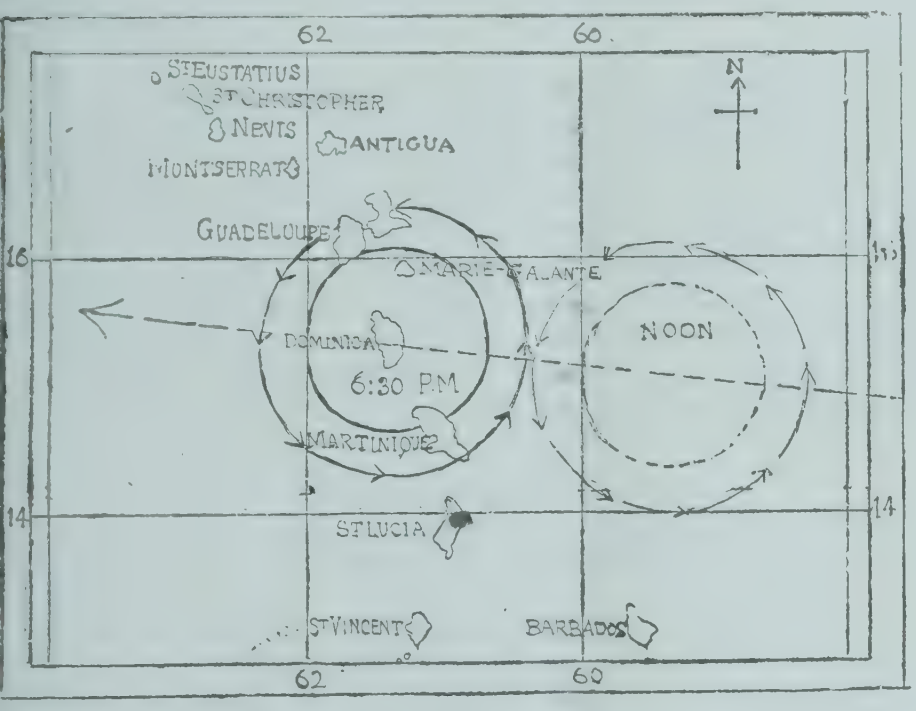


FIG. 17. PASSAGE OF THE CYCLONE.

The observations made in the different West Indian islands fully substantiate the nature of the disturbance as indicated in the above diagram. In Dominica, at the approach of the storm north winds were experienced with a falling barometer. About 6.30 p.m. there was a lull with the barometer at 29·35 inches, the lowest point to which it fell. This indicated the passing of the centre. After that the wind veered to the south and blew with renewed vigour, and then eventually subsided. These observations are clearly in accord with the wind directions indicated by the arrows in the diagram.

In regard to observations in the other islands lying north and south of Dominica, it must be pointed out that the area of a cyclone is not definitely circumscribed as might be thought from the diagram. The circles merely represent the inner zones of greatest intensity. The cyclone has a much greater radius of influence, which gradually diminishes towards the periphery. This accounts for the weather conditions experienced in places as distant from the centre as Barbados and Antigua.

In Barbados, on the morning of the 10th, the wind, which was moderately light after blowing for a short time from the north, changed with increasing intensity to south-west and then south, from which quarter it continued to come for some hours, thus leading local observers to feel that the passing cyclone was gathering force, this southerly wind representing a considerable indraught into the cyclonic area. From these facts it is evident that only the outer zones of the disturbance passed over Barbados.

In St. Lucia some slight damage was done to trees by the westerly and south westerly wind experienced in the evening of the 10th instant, and strong southerly winds occurred in St. Vincent. The conditions in St. Kitts were much the same as in Antigua.

In Antigua, as would be expected, the wind first blew from the north, then from the north-east changing to east, and then, as the disturbance passed over, to the south-east and ultimately to south, when the weather became calm. Between the change from north-east to south-east the barometer reached its lowest point, namely 29·775 inches at 6·15 p.m. This, as would be expected, is a higher reading than that registered at Dominica about the same time (29·35 inches). The gradient of atmospheric pressure is naturally slighter on the outskirts of the cyclone than in the path of the centre.

The foregoing account shows very plainly the importance of wind observations during the course of a cyclone as by a comparison of these at different times and places the position and path of the centre of the disturbance can be made out. The barometrical readings indicate the intensity of the storm and the relative rate at which it may be expected to be advancing or retreating. It is important that observers should record the direction of the wind and the changes that take place as the cyclone passes: the hour of the day should be stated in the observations. The directions of the wind are as important as the height of the barometer in forming a clear picture of the cyclone and its progress. Wind observations should be based on the movements of the lower clouds rather than upon the indications of surface objects like weather cocks or flags.

In regard to the East Africa Protectorate, the year 1913-14 is characterized as one of conspicuous development in nearly all branches of farming. In March it was estimated that over 5,000 acres were under coffee cultivation, while there are said to be large areas of land equally suitable for cultivation of this crop. A coffee plant inspector was appointed from Jamaica and the appointment has proved very popular among the settlers.

Changes in the Guiana Scholarship.—A circular letter has been addressed by the Government Secretary to the Combined Court with reference to proposed changes in the regulations regarding the Colonial Scholarships. British Guiana being an agricultural country, it is thought that it should be laid down that in the case of two scholarships in every three years the winners must study scientific agriculture or engineering, or undergo a course of industrial training at some college or institute selected by the Government, and that one scholarship only in every three years should be awarded for law, medicine or arts. It is also considered that no scholar be allowed to enter as a student at one of the Inns of Court for call to the Bar unless he has the means of so doing without encroaching on the scholarship allowance.

PLANT DISEASES.

SPRAYING OF GROUND NUTS FOR LEAF RUST.

Mr. W. Robson, Curator of the Botanic Station, Montserrat, has forwarded a report on the results he has obtained in the current year from a comparison of sprayed and unsprayed sections of a plot of ground nuts. The experiment was directed to the determination of the amount of increase in yield to be obtained from the control of the rust fungus *Uredo arachidis*, Lag., by means of Bordeaux mixture.

Mr. Robson's report on a similar experiment carried out in 1914 was published in this Journal, Vol. XIII, p. 380.

The plot, which was situated at Grove Station, was planted on April 12 with the Virginia Running variety set at a distance of 2 feet each way. The ground has an easy decline to the west, and the eastern half was intentionally chosen for spraying, for the reason that the lower (western) extremities of such plots usually give the largest crops, though no actual knowledge is available as to this particular plot. The sprayed and unsprayed sections were each $\frac{1}{15}$-acre in area, and each was again divided for the purpose of comparing the yields of sub-sections thinned out to one plant to the hole and others left with two. An additional, more legitimate complication was introduced by the variation of the number of times the sub-sections of the treated portion were sprayed. The accompanying diagram will make the explanations easier to follow:—

East

A2	A1
B2	B1

West

A represents the sprayed section, B the unsprayed. A2 and B2 were left with two plants to the hole, A1 and B1 with only one. Spraying was carried ont as follows:—

A1, thrice, at 46, 59, and 74 days from planting.
A2, twice, at 59 and 84 days from planting.

In other words, A2 was sprayed at $8\frac{1}{2}$ weeks and again after an interval of $3\frac{1}{2}$ weeks, while A1 was first sprayed at $6\frac{1}{2}$ weeks and twice again at fortnightly intervals.

Pustules of the rust fungus were first noticed on the unsprayed portion on July 23 or just a month before the nuts were reaped. At the time of reaping the foliage on a considerable portion of this unsprayed plot was withered and dropping from the plants, and the remainder was much browned, practically every developed leaf being covered with the pustules of the fungus.

No significant development of the fungus was to be seen on the sprayed sections up to the time of reaping; only a few scattered leaves could be found carrying pustules. Reaping was a week later than in the case of the unsprayed sections, and even then the foliage of the plants was fairly green and healthy.

The yield of the sprayed plot was 28 per cent. more than that of the unsprayed plot, as set out below:—

Treatment.	Area.	Date of reaping.	Weight as reaped.	Rate of yield per acre.
Sprayed	$\frac{1}{15}$-acre	Aug. 30	336 lb.	5,040 lb.
Unsprayed	$\frac{1}{15}$-acre	Aug. 23	263 lb.	3,930 lb.

(The loss of weight in drying may be taken as about 50 per cent.)

In 1914 the rate of yield of fresh nuts per acre (Gambia variety) was 2,496 lb. for the unsprayed, and 3,558 for the sprayed section, an increase of 42 per cent.

The plots were kept under close observation and it can be definitely said that the rust fungus has been effectively controlled by the Bordeaux mixture. The spraying was carried out with a barrel pump at 80 lb. pressure; a Mistry Junior nozzle was used.

As regards the subsidiary experiment, the section A 1, which had one plant to the hole and was three times sprayed, gave 139 lb. of fresh nuts as compared with a yield of 197 lb. from A 2, which had two plants to the hole and was twice sprayed.

The corresponding unsprayed sections B 1 and B 2 yielded 103 lb. and 160 lb. respectively. It would appear that there is a very definite gain from leaving two plants as against one.

With regard to the general application of the results of the spraying experiment the caution given last year may be repeated. The degree of infestation of the plants by this fungus depends largely on conditions of soil and climate. When the conditions are favourable to the host, only the leaves which are approaching senility are infested; in other circumstances the fungus can be so severe as to kill the plants outright. The improvement to be expected from spraying must therefore vary considerably from one place to another, and from year to year.

W.N.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. A list of the exports of the island with their declared values for the years 1913 and 1914 appears in the *Government Gazette* for September 30. The export of arrowroot exceeded in value those of 1913. Cassava starch shows a reduction as a result of reduced cultivation. Sea Island cotton also shows a falling off, but this must be attributed to delayed shipments and not to a decrease in production. According to the *Sentry* for October 1, the island was visited on the previous Monday by a thunderstorm of considerable force, but up to the present notice has not been received of any fatality or noticeable damage to property by lightning. According to the same paper the peasantry and other land owners are responding to the Government's enterprise in installing machinery for shelling and kiln-drying Indian corn on a co-operative basis at the Government central factory. The machine is capable of shelling 12 barrels of corn per hour and dries the same as rapidly as the shelling appliances can supply the kiln, which has a capacity for 3 tons. The Government is paying 3*s.* 4*d.* per 100 lb. for corn cob or 1c. per lb. for shelled corn, and at the close of the season when the produce is sold, profits will be distributed in the form of a bonus amongst the sellers.

According to the *Voice of St. Lucia* for September 25, good progress is being made both in St. Lucia and St. Vincent in regard to the campaign for the eradication of hook worm disease. House-to-house visits are being made and sanitary latrines are being erected.

ST. LUCIA. From this colony Mr. A. J. Brooks writes to say that during September the picking of cacao and limes was in operation while the appearance of the cane crop was very satisfactory. Special work on the part of officers of the Department consisted in the surveying and laying out of the Choiseul village extension, and in paying out bonuses to vendors of the lime juice factory. In connexion with the latter, 24 casks of concentrated juice and 5 carboys of distilled oil were shipped during the month. The advisory committee appointed by the Administrator in connexion with the lime juice factory had its first meeting at the Treasury on September 20.

The rainfall for the month at the Botanic Gardens, Castries, was 11·87 inches; rain fell on twenty-six days. At the Agricultural and Botanic Station, Choiseul, 6·51 inches were received, which fell on fifteen days.

The distribution of plants continues actively as usual. The following are the figures recorded for September: limes 2,011; oranges (budded) 36; economic 200; decorative, 36, giving a total of 2,283. A considerable quantity of vegetable seed was also distributed.

ST. KITTS. Mr. F. R. Shepherd informs this Office that the chief work during September at the Experiment Station consisted in the picking of cotton from the selection and manurial experiment plots. The returns are, so far, excellent both in quantity and quality. Owing to the seasonable weather, the cane crop throughout the island has made great progress, and there is every prospect of a large crop for next season. The canes are healthy and growing vigorously. The only sign of any disease is in the case of B. 208, which on some estates is attacked by root fungus (*Marasmius sacchari*); but this variety is being gradually discarded. The estate cotton is being reaped, but there will not be so good a return as was at first expected on account of the constant rains and high winds. In the Valley district the yields will no doubt be fair, but in the northern districts returns will be below the average. A meeting of the Agricultural and Commercial Society was held on September 7, when the results of the reaping of the sugar-cane varieties were laid before the meeting by the Agricultural Superintendent. The rainfall for the month at Basseterre was 4·39 inches; the total precipitation so far for the year is 39·98 inches at Basseterre, and 60·90 inches in the northern districts. The following is a summary of the work conducted at the Government Laboratory by Mr. H. Waterland, the Chemical Assistant: Direct polarization of sugar from Central Factory; physical analysis of soil; determination of organic carbon in soil; determination of nitrogen in soil; analysis of one sample of cane tops; estimation of water, protein, and fat in sample of cane tops; analysis of three samples of milk sent by the Inspector of Police; and analysis of three samples of milk from the sub-Inspector of Police in Nevis.

DOMINICA. His Excellency the Governor has been pleased to appoint provisionally, pending the signification of His Majesty's pleasure, Dr. H. A. A. Nicholls, C.M.G., to be a member of the Executive Council of the Presidency. According to the Dominica *Chronicle* for Saturday September 25, the weather was very unpleasant on the previous Wednesday, when there were frequent south-westerly squalls with continuous and heavy showers of rain. On Tuesday night the barometer dropped to 29·78, on Wednesday it was stil unsteady, but the following day it tended upwards to its normal point. It is supposed that the troubled weather was to be linked with a cyclone near Dominica for following message was received from the United States weather Bureau: 'Some indications of disturbance immediately west of Dominica.' The rainfall registered at the Botanic Gardens for the two days (September 21 and 22) was 5·32 inches.

A note appearing in the Dominica *Guardian* for September 9, calls attention to the sudden rise in the price of green limes in New York at about that date. It is urged that shipments should be properly regulated to prevent a glut, and that the same care should be bestowed upon packing and grading as is done in the neighbouring island of St. Lucia.

AFRICAN AGRICULTURE.

The following particulars in connexion with agriculture in Africa are abstracted from *Diplomatic and Consular Reports*—No. 5423, Annual Series; and *Colonial Reports Annual*, Nos. 821, 825, 840, and 843. The total value of ground nuts exported from French West Africa in 1914 was 59,891,540 francs or £2,395,661. With regard to the yield of ground nuts it is not easy to obtain reliable information upon the subject from native cultivators. The average might be from 800 to 1,000 kilos. per hectare. The research station at M'Hambey, which was built for the purpose of carrying on a scientific study of the cultivation of the ground nut plant, should, it is believed, in a few years, be able to give valuable advice and information upon the subject.

Two experimental plantations were opened during 1913, one at Maigana near Zaria in the drier portion of the Protectorate of Nigeria to the north, and the other at Aguji, some 30 miles east of Ilorin, in the more humid climate of the Niger valley, some 200 miles further south. The object of both these farms was primarily to test the suitability of the respective pistricts for cotton growing. In addition to cotton, however, a number of other crops were also under experiment including green and leguminous crops of various kinds, ground nuts, maize, and fodder crops. A special point was made at both these plantations of the training of native instructors or overseers, with a view to placing them in charge of trial plots in out-districts, and other agricultural work. A comparative statement, compiled by the Comptroller of Customs, of the quantities and values of those agricultural exports of Nigeria which are of principal interest to the Northern Provinces, shows that there was a remarkable increase in the export of ground nuts during the year. Shea nuts also show a very satisfactory increase. The slight rise in export of cotton from Northern Nigeria was principally due to the greatly increased output of the Ilorin Province; it is mentioned that in the majority of districts the popularity of cotton cultivation is on the wane, its place being taken by ground nuts and Indian corn, which prove to be more paying crops.

As the export of cotton for both the Nigerias is included by the customs in one return, it is not possible to state the proportion which can be credited properly to either the northern or the southern Protectorate, and the figures given in this connexion are for the whole of Nigeria. The total average export of cotton lint and cotton seed for the past five years has been as follows: cotton lint 36,578 cwt. value £102,168; cotton seed 3,766 tons value £9,163. The average export of cacao for a similar period was 7,430,147 lb. value £125,150.

MARKET REPORTS.

London.—The West India Committee Circular, September 7, 1915.

Arrowroot—2*d.* to 4¾*d.*
Balata—Sheet 2*s.* 4½*d.* to 2*s.* 5*d.*; block 1*s.* 9*d.*
Beeswax—No quotations.
Cacao—Trinidad, 81/- to 85/- per cwt.; Grenada, 76/- to 80/-; Jamaica, 72*s.* to 73*s.*
Coffee—Jamaica, no quotations.
Copra—245*s.* to £24 15*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 13*d.* to 16*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 55/- to 75/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/8 to 3/9; concentrated, £30; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—9*d.* to 2/11*d.*
Nutmegs—4¼*d.* to 5¾*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 2/4½; fine soft, 2/3; Castilloa, 2/1½.
Rum—Jamaica, 4/2 to 4/9

New York.—Messrs. Gillespie Bros. & Co., October 1, 1915.

Cacao—Caracas, 17½c. to 17¾c.; Grenada, 17¾c. to 18¼c.; Trinidad, 18¼c. to 18¾c.; Jamaica, 15c. to 15½c.
Coco-nuts—Jamaica and Trinidad selects, $28·00 to $30·00; culls, $18·00 to $19·00.
Coffee—Jamaica, 7¼c. to 11c. per ℔.
Ginger—13½c. to 16c. per ℔.
Goat Skins—Jamaica, 43c.; Antigua and Barbados, 40c. to 43c.; St. Thomas and St. Kitts, 38c. to 40c. per ℔.
Grape Fruit—Jamaica, $2·75 to $3·25.
Limes—$5·00 to $6·50.
Mace—36c. to 50c. per ℔.
Nutmegs—11c. to 11½c.
Oranges—Jamaica, $2·50 to $3·00.
Pimento—3¼c. per ℔.
Sugar—Centrifugals, 96°, 3·75c. to 3·89c.: Muscovados, 89°, 3·10c. to 3·24c.; Molasses, 89°, 2·97c. to 3·11c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., October 4, 1915.

Cacao—Venezuelan, $17·75 to $18·25; Trinidad, $17·50 to $18·25.
Coco-nut Oil—72c. per Imperial gallon.
Coffee—Venezuelan, 9c. to 11c. per ℔.
Copra—$4·25 to $4·40 per 100 ℔.
Dhal—$6·25 to $6·50
Onions—$3·00 to $3·50 per 100 ℔.
Peas, Split—$9·75 to $10·00 per bag.
Potatoes—English $1·25 to $2·00 per 100 ℔.
Rice—Yellow, $5·80 to $6·25; White, $5·75 to $6·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 2, 1915; T. S. Garraway & Co., October 6, 1915; W. P. Leacock & Co., October 8, 1915.

Arrowroot—$4·50 to $4·60 per 100 ℔.
Cacao—$15·00 to $16·00 per 100 ℔.
Coco-nuts—$16·00 husked nuts.
Hay—$1·70 per 100 ℔.
Manures—Nitrate of soda, no quotations; Cacao manure, $50·00; Sulphate of ammonia, $85·00 per ton.
Molasses—No quotations.
Onions—$4·00 per 190 ℔.
Peas, Split—$12·00 per 2·10 ℔.; Canada, $5·40 per 120 ℔.
Potatoes—Nova Scotia, $2·75 per 160 ℔.
Rice—Ballam, $6·20 to $6·50 per 190 ℔.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $4·25.

British Guiana.—Messrs. Wieting & Richter, September 18, 1915; Messrs. Sandbach, Parker & Co., October 1, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$9·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	15c. per ℔.	18c. per ℔.
Cassava—	$1·20	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	13c.	18c. per ℔.
Jamaica and Rio	14c. to 15c. per ℔.	14c.
Liberian	——	10c. per ℔.
Dhal—	$6·50	$6·80
Green Dhal	——	——
Eddoes—	$1·44	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	5c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 ℔.)
Marseilles	——	5c. to 6c.
Plantains—	24c. to 40c.	——
Potatoes—Nova Scotia	$3·00	$3·00 to $3·25
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·68	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
Tannias—	$3·12	——
Yams—White	$2·64	——
Buck	$3·36	——
Sugar—Dark crystals	$3·75 to $3·85	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

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Scientific and Vernacular Naming.

PRECISION was first given to the naming of plants by Linneus or von Linné, the great Swedish physician and botanist who lived in the eighteenth century. Based on sound principles, his binominal system of nomenclature persists in all essential particulars at the present day, and if employed with care and discretion, these binominal designations constitute perhaps the most scientific feature of biology. The names of plants as conceived by Linneus are of two kinds: those of the class and order, which are *understood*; and those of the genus and species, which are *expressed*. The name of the class and order never enters into the denomination of the plant, though at the same time it is always connoted. All plants agreeing in genus have the same generic name, and each generic name must be single; and further, two different genera cannot be designated by the same name. Linneus also laid down the rule that the best generic names are those which express the essential character or habit of a plant. In addition, he formulated other maxims concerning the etymological constitution of botanical names, limiting their construction to Latin and Greek: although many of these latter canons have been criticised as trivial and unimportant they are generally respected at the present day. In regard to the second or specific name, which is supposed to point out the particular species of each genus, we should again remember that those which indicate a decided specific character are the best. A good example of an intelligent specific name is found in *Panicum maximum*, where the generic name denotes the characteristic inflorescence of the genus, and the specific name the idea of size. To designate a variety, it should be mentioned that a third name preceded by the abreviation 'var.' is used after the second or specific name.

It is not unusual to use the name of a person as a specific name (spelt in the case of botanical, but not of zoological names, with a capital letter) in the possessive case, as *Thrinax Morrisii*; and in the case of all botanical and zoological names, the name (generally abbreviated) of the authority should be attached to them in order to avoid confusion in connexion with synonyms, thus *Saccharum officinarum*, L. This question of synonymy is a wide subject of the greatest importance in biology. We cannot in the space of this article presume to discuss it at any length, but one or two aspects may be referred to.

Amongst the flowering plants our present knowledge of systematy is sufficiently definite as regards genera for there to be little confusion possible in that connexion. But in the case of specific names it is otherwise, and it is quite common to find the same plant called by different names in different places by different botanists. For this reason the critical revision of genera is a very important branch of pure botany. The trouble lies principally in two directions. First, opinions differ as to what shall constitute a specific difference. Amongst systematic biologists we find two more or less distinct classes of observers who labour under the jocular but expressive names of 'lumpers' and 'splitters'. A 'lumper' is a botanist who shows a tendency to group closely allied forms under the same name, while a splitter' exhibits a tendency in the opposite direction, namely, to separate forms of close resemblance under different specific names. Either extreme is wrong, but in the light of modern biology, the tendency to excessive subdivision is perhaps the worse. The point is that a so-called species is not a fixed entity; species are constantly changing by slight mutations, or by acquired variations; and a specific name at best is but a provisional and temporary designation. The second reason for confusion in specific names lies in the circumstance that a describer may not be familiar with the work of others in different countries. This obstacle is being gradually overcome by increased facilities as regards literature and the exchange of specimens; but there still remains a need for more central 'clearing houses'. It should be remembered in the present connexion that the Royal Botanic Gardens, Kew, perform an important service of international influence in the matter of botanical nomenclature. The publication of the *Index Kewensis* has enormously reduced the confusion resulting from the existence of synonyms. The work goes on from year to year, and supplements of this remarkable index are issued at convenient intervals. In its pages the names which stand are printed in Roman type, while the synonyms appear in Italics. It is one of the indispensable works of systematic botany.

If we turn to the lower plants, especially the fungi, we find a much greater want of precision than amongst the flowering plants. The classification of the fungi is unfortunately artificial in many respects; nor can this be wondered at, considering their comparatively simple structure. Morphological differences are often very minute and slender, and we not infrequently have to depend upon such varying factors as colour and shape as a means of distinguishing genera and species. In the case of fungi which are not highly parasitic, it is possible to decide upon specific differences by means of comparable cultures. The genus Fusarium, for instance, is being studied after this manner in the United States. Different forms of the genus from all over the world are being grown in culture media under the same conditions, and it is hoped by means of the observations obtained to decide what forms are distinct and what are similar. It will be readily realized how important it is to eliminate synonyms amongst the fungi, by considering the case of Die-back disease of cacao. The fungus causing this disease has been known under at least half a dozen different names in different parts of the world, and it was only after a critical examination of the forms in the Federated Malay States that Bancroft came to the conclusion that they were all one and the same organism, which he named *Thyridaria tarda*. The practical importance of a result like this is considerable. The distribution of the fungus becomes definitely known, and legislation can be introduced accordingly. Further, methods of control formerly recommended as applying only to one form of fungus of supposedly limited distribution becomes afterwards applicable, at any rate theoretically, to half a dozen which were at first thought to be distinct.

Generally speaking workers on the fungi are inclined towards the class of 'splitters' previously referred to. There is a tendency to name new species on slender differences, and what is perhaps worse, to split up unduly established genera. Some evidence goes to show that this has been done for the sake of self-advertisement rather than in the interest of science. It is desirable that when they occur such tamperings should be ruthlessly exposed.

Having discussed in outline the origin, uses, and some of the dangers attendant on scientific naming, we may profitably consider next the corresponding features of common or vernacular names. It is a mistake to think that common names of plants and animals are necessarily unscientific. Many conform to the canon of Linneus, which says that names should express the essential character or habit of the plant and are accordingly highly instructive. Examples of this are very numerous: thus, nut grass (*Cyperus rotundus*) is so called because of the little tubers on the roots of this plant. On the other hand, the name nut grass is unscientific on account of the fact that the swellings are not nuts but tubers, while the plant is not botanically a grass but a sedge. Less open to criticism is the name soap-berry (*Sapindus saponaria*) so called because the fruit of this plant will, when

macerated in water, produce a lather like soap; and again love vine (dodder) *Cuscuta* sp., named after its habit of parasitic embrace; and sea-side grape (*Coccoloba uvifera*), so called on account of its maritime habitat and the superficial resemblance of the ripe fruit to purple grapes. But the common or vernacular name has many serious defects compared with the scientific designation. In the first place a popular name tells us nothing about the class or order to which the species belongs, that is to say, it gives us no clue whatsoever as to its position or status in the classification of the vegetable kingdom. Further, there is the more serious aspect from a practical point of view, that even in the same place a plant may be known by more than one common name. Thus *Bryophyllum calycinum* is known both as Wonder-of-the World and Love Bush; *Borrichia arborescens* as Sea-side Oxeye, Sea-side tansy, and Samphire; and the common *Vinca rosea* as Old maid or Periwinkle. When we come to consider the matter from an international point of view, it becomes even more obvious that scientific naming is essential Thus in the case of the genus of fruit trees designated Anona, the same species is called by entirely different names in various parts of the world, and it would be hopeless to attempt to use a popular nomenclature in writing of this group. That such should be the case is almost a foregone conclusion on account of foreign languages. In the West Indies, even, we find that the admixture of French and English, and to some extent Spanish, leads to great confusion in regard to vernacular names. The desirability of using Latin and Greek for scientific names is not, as Linneus thought, because these are less barbarous than the modern languages, but because the dead languages are more fixed and international.

The subject of scientific and vernacular naming is a wide one, but it is believed that in the foregoing we have referred to most of its principal aspects. It will be realized that if employed at all, it is essential to use scientific names intelligently, and with due regard to synonymy and the vernacular. Very frequently the common name is a quicker and better means of indicating a species than the scientific, though as a general rule it may be laid down that it is safer and more scientific to use both kinds of names. In this connexion we would call the attention of writers in the East to the fact that the employment of the Indian vernacular without the scientific, or at least the English equivalent, very often makes their literature quite unintelligible in other countries, which is a pity on account of the high standard and general interest of much of the Indian work. No reference has been made in this article to the pronunciation of scientific names as this is a matter which lies somewhat outside the present subject. If the continental system is unfamiliar to him, the beginner will do well to pronounce Latin in the same way as we should English, in giving the same value to the vowels. Accentuation and some of the consonants occasion a certain amount of difficulty, but very slight attention to the marks and directions to be found in many botany books will lead anyone to a correct pronunciation. It is hardly necessary to point out that a knowledge of the classical languages themselves is of great use in connexion with scientific names, and may be regarded as essential to those botanists and zoologists who are engaged in the study of systematy.

Monograph on Sansevieria.—A useful key to the different species of Sansevieria is contained in the *Kew Bulletin of Miscellaneous Information*, No. 5 of 1915. Many species of this genus are largely cultivated in various parts of the tropics for their valuable fibre, which is of excellent quality in almost all, although varying with the species. It is understood, however, that there is considerable doubt in regard to the proper names of the plants from which Museum and other specimens of fibres have been obtained. One of the most interesting characteristics of this genus is the very remarkable change which takes place in the form of the leaves of many of the species as the plant advances from the juvenile to the adult stage. This variability renders it impossible to name specimens that are not of adult age—a matter which should be remembered by agriculturists and others who may desire at any time to have determinations made for them.

The Sediment Test for Lime Juice.—Concentrated lime juice is tested for sediment as follows: 100 c.c. of concentrated juice is diluted with water to 1,000 c.c., care being taken to effect thorough mixing. The mixture is allowed to stand overnight in a graduated 1,000 c.c. cylinder, and the level of the sediment is read off. The reading is recorded as *units of sediment.*

This has sometimes been incorrectly stated as percentage of sediment.

The method is a conventional one, convenient for purposes of comparison. It now possesses additional interest in view of the efforts that are being made in the West Indies to prepare concentrated lime juice on a commercial scale, as free from sediment as possible. The units of sediment may range from 2 or 3 in samples containing little sediment up to 100 in samples prepared with little regard to its removal.

An interesting botanical review of the *New English Dictionary*, consequent on the death of its editor Sir James Murray, appears in the *Kew Bulletin of Miscellaneous Information* (No. 7 of 1915). Amongst other matters, the spelling of the fruit of *Cocos nucifera* is discussed, and it is shown that the incorrectly spelt Cocoa-nut instead of Coco-nut is due to confusion with Cacao. Other botanical words discussed include Cinchona, which according to its derivation should really be spelt Chinchona.

LIME CULTIVATION.

ST. LUCIA GOVERNMENT LIME JUICE FACTORY.

The following report on the business working of the St. Lucia Factory for the crop June 1, 1914 to March 5, 1915, has been received from the Agricultural Superintendent in St. Lucia (Mr. A. J. Brooks).

The factory opened on May 29 with prices fixed on a £24 basis, viz.: 3*s.* 9*d.* per barrel for ripe limes, and 6*d.* per gallon for raw juice, testing 12oz.

Owing to the abnormal conditions created by the War it was impossible for some months to gauge what the effect would be on the lime juice market, and as a protective measure the prices paid for produce as first payment fluctuated from 1*s.* 8½*d.* to 4*s.* 8*d.* per barrel for limes, and for raw juice from 3½*d.* to 6*d.* per gallon.

Upon receipt of the account sales for the first few shipments of concentrated juice, it was seen that the prices had risen far above the brightest expectations.

The whole of the concentrated juice shipped from the factory between June and October sold on the record basis of £52 10*s.* per standard pipe (108 gallons, testing 64oz. to the gallon).

The following three shipments sold on a £42, £38, and £37 basis, respectively; the remaining shipments sold at £31.

Every effort was made to improve the quality of the juice manufactured, by straining, subsiding, skimming and careful boiling. In this way the average sediment was reduced to 2½ to 3 units.

Each strike of juice was carefully tested while boiling, and again after cooling, the average test for the entire crop being 108·3 oz. citric acid per gallon.

The produce dealt with was 1,410¾ barrels of fruit, and 5,715⅜ gallons of juice, which represents a total crop of 2,125½ barrels, as against 326 of the year previous.

The business of the factory was conducted on a co-operative basis. The price paid for produce was based on a scale of prices having relation to the current market value of concentrated juice and insuring a margin of profit to the factory. The following charges were then deducted from the proceeds: actual working expenses, 10 per cent. interest and sinking fund on capital, 6 per cent. interest on money advanced for purchase of produce, and a sum of £50 for Government supervision.

Under these conditions the vendors received a total payment of 9*s.* 11*d.* per barrel of limes, and 1*s.* 1⅞*d.* per gallon of raw juice, this being 4*s* 2½*d.* per barrel, and 5⅜*d.* per gallon in advance of the price paid to vendors the previous year.

The amount paid to the Government, as shown by the attached Balance Sheet, was £128 14*s.* as against £13 2*s.* 1*d.* for the year 1913-14.

Every effort was made to reduce the working expenses to a minimum, and the actual expenses incurred in the manufacture of a 42-gallon cask of concentrated lime juice, testing 107·3 oz. per gallon, yielding 19lb. of distilled oil are given below.

These figures are based on a year's work at the Government Lime Juice Factory, and although they are obtained as the result of working on a small scale under somewhat unusual conditions, the total may provisionally be considered representative of the industry in St. Lucia. It will be noticed that the extra charges resulting from the war are considerable:—

	£	s.	d.
Labour		5	11½
Coal		11	3¼
Oil for engine		1	5¼
Packages		4	9
Contingencies		2	0½
Total local expenses	1	5	5¾
Sale of produce	1	15	0
	£3	0	5¾
Less extra charges due to war		13	11
	£2	6	6¾

This does not include charges for Manager's or Overseer's supervision.

The number of persons having business dealings with the factory increased from 96 to 728 during the year. Of this number eleven were planters whose individual areas in lime cultivation do not at present warrant the erection and maintenance of separate works.

The total amount of produce purchased from this source was 482½ barrels of limes, and 5,459¾ gallons of juice, which represents a sum of £554 17*s.* 7½*d.*; the largest total amount received from any one planter being 2,711¼ gallons of juice, and the smallest 7¾ barrels of limes.

The peasants dealing with the factory numbered 717. The full name and address of each vendor were carefully taken, and in this way a valuable record has been started which, if added to year by year, will enable the agricultural officers to keep in close touch with the extension of the lime industry amongst this class of cultivator. Their properties are being visited with a view to improving the present methods of cultivation and increasing the yields obtained.

The following list shows the number of vendors from each district having business dealings with the factory:—

Castries District*		342	Anse-la-Raye	District	27
Gros Islet†	,,	296	Canaries	,,	7
Dennery and Mabouya	,,	36	Soufrière	,,	4
Praslin	,,	4	Choiseul	,,	2
Micoud	,,	2	Laborie	,,	5
			Vieux-fort	,,	3

Of the total sum of £1,217 11*s.* 1*d.* paid out by the factory, two vendors received over £100, two over £50 and under £100, one over £20 and under £30, seven over £10 and under £20, and eight under £5.

The smallest total sum paid to any one peasant was 6*d.*, and the largest £22 8*s.* 8*d.*

ST. LUCIA GOVERNMENT LIME JUICE FACTORY.

Results for the crop commencing June 22, 1914, and ending February 27, 1915.

*Castries District includes: Castries and suburbs; Monkey Hill; Trois Pitons; Mark; GrandMaison; Babonneau; Cabriche; Ti Rocher.

†Gros Islet includes: Gros Islet; Dauphin; Marquis Heights; Monier; Monchy; Esperance; Derameaux; Grand Riviere; La Brolot; Riviere Balata; Paix Bouche; Garonne, etc.

RECEIPTS.

	£	s.	d.
Net proceeds from sale of 44 casks concentrated lime juice	1,102	7	7
Net proceeds from sale of 9 carboys distilled lime oil	115	3	6
Total Receipts	1,217	11	1

EXPENDITURE.

Paid for produce	298	18	6
Deferred payment bringing produce to rate of 4*s.* 8*d.* per barrel limes and 6*d.* gallon of juice	174	18	6
Factory working expenses including labour, coal, oil, packages, repairs, etc.	54	18	9
Total Expenses	528	15	9

GOVERNMENT REFUND.

	£	s.	d.
Ten per cent. Interest and Sinking Fund on Capital Account of £550 for 10 years from April 1, 1914	55	0	0
Six per cent. on Purchase of Produce Advances £300	18	0	0
Supervision	50	0	0
Value of Lime Oil on hand and paid to Vendors in last crop	3	12	0
Value of Concentrated Juice on hand, etc.	2	2	0
Total Government Refund	128	14	0

Total receipts	£1,217	11	1	
Total working expenses	528	15	9	
Government Refund	128	14	0	
Total expenditure	£ 657	9	9	
Profits for distribution	£ 560	1	4	

Profits now due to Vendors at the rate of:

5*s.* 3*d.* per barrel limes, bringing the total price to 9*s.* 11*d.* per barrel.

$7\frac{7}{8}d.$ per gallon juice, bringing the total price to 1*s.* $1\frac{7}{8}d.$ per gallon.

THE BUDDING OF LIMES.

Had the budding of limes, writes Mr. Joseph Jones, in his recent annual report, been mooted in Dominica a few years back as a reasonable measure for the improvement of lime cultivation, it is probable that the suggestion would have received scant consideration. It would have been pointed out that the lime was probably the hardiest of the citrus family grown in the tropics; that the use of other species of citrus as stocks for limes was unlikely to lead to improvement, while the cost of producing plants would be raised from a few shillings per acre for seedlings to £4 or £5 for budded plants, the latter being a very serious addition to the initial expense of planting new areas.

This aspect of the situation, once so strongly held, has been modified during recent years. With the extension of the area under limes there has been the usual increase of pests and diseases. However hardy the lime may be when grown individually, or in small areas, it is highly susceptible to root diseases when massed in cultivation, both in dry and wet districts. To a considerable extent these diseases may be kept under control by a strict outlook, and an efficient system of drainage, but their presence renders it important that trials should be made to test the value of certain stocks for limes, with a view of securing immunity from root diseases under sound conditions of cultivation. To this end, the budding of limes on Sour Orange stocks was tried some time ago. The Department has now $\frac{3}{4}$-acre of budded limes in the Experiment Stations, whilst a number of plants have been distributed to estates for trial.

The selection of the sour orange for a stock was largely due to the fact that in one district in Dominica in which lime root diseases are prevalent, there exists a plantation of several thousands of orange trees budded on this stock, not one of which has been attacked. Whether the sour orange will prove a suitable stock for limes in all respects remains to be seen. The lime is somewhat difficult to bud on to it. On lifting the plants from the nursery beds for transplanting in the field, a small percentage of the scions will die, which tends to show that the union is not altogether a congenial one. Also on this stock there is a considerable tendency on the part of the scion after only a little growth has been made, to flower and fruit. If fruiting is permitted at an early stage, the plants would remain in a stunted condition. From observations to date it would appear necessary to pick off the flowers or small fruits from budded trees, and to manure the stock with a view of getting sufficient growth to form a fair-sized tree before bearing is permitted.

In the progress report for 1913-14, reference was made to the arrival of six small plants from Kew, of a stock used in Morocco for oranges, and said to be resistant to foot disease. In that country the plant is propagated by cuttings for use as stocks. It is known by the name of '*M'gergeb*', and is evidently a variety of the citron (*Citrus medica*).

The plants received in Dominica have grown well. Considerable progress has been made in striking cuttings, and it is hoped to have at least $\frac{1}{4}$-acre planted with limes on M'gergeb stocks shortly, as well as to distribute a number for trial in the out-districts.

It is also intended to bud a number of limes on the common citron for trial. The habit of the citron in spreading by means of throwing suckers from the roots will need to be controlled when used as a stock. This, however, should not be difficult.

Unlike the sour orange, the two last named plants are closely related to the lime. Consequently, it is expected that the budding process will be easily accomplished in both instances.

Those who have had citron plants under observation cannot fail to have noticed the powerful system of surface roots which these plants possess. The question arises as to whether such plants are better able to obtain the supply of plant food from the soil, and to make a fuller use of manures applied in the course of cultivation than plants less favourably furnished with roots. If so, the dense surface root system of the citron should be an important factor in estimating its value as a stock for limes.

The experiments outlined are necessary and important in the interests of the lime industry. Should it be shown as a result of these trials that the use of certain stocks secure immunity from root disease, and that the capital invested in lime cultivation is proved to be safer from the constant menace of uprooting during gales to which the lime on its own roots is subject, then valuable information will have been gleaned. The higher cost of budded plants over seedlings, now regarded as practically prohibitive, would under such conditions be amply justified.

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 4, with reference to the sales of West Indian Sea Island cotton:—

A good business has been done in West Indian Sea Island cotton since our last report. The sales of white cotton amount to about 400 bales; these include St. Vincent 16*d.* to 19*d.*, Montserrat 15*d.* to 15½*d.*, Antigua 14½*d.*, Anguilla 14½*d.* to 15*d.*, Barbados 14½*d.* to 16*d.*, also about 300 bales of Stains chiefly at 7*d.*

The market is firm, but consumers are chiefly purchasing to stock, hoping that if hostilities are not too far prolonged, there will be more business in the market for fine yarn.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 9, is as follows:—

Islands.—The receipts this week were 83 bales, of which 24 bales were a crop lot of last year sold on private terms. The total receipts of new crop to date are about 110 bales, which factors are not yet offering, waiting for some further accumulation of stock before doing so. Consequently the market has not as yet opened, but with freer receipts from now on there will probably be some offerings on the market this coming week, enabling us to give quotations.

Floridas and Georgias.—The demand in Savannah has continued very general and active throughout the week, taking all offerings of all grades at advancing prices, and all the interior markets have been excited, where even higher prices are being paid.

The buying is very general and the offerings do not satisfy the demand, as a large proportion of the receipts are being held in expectation of still higher prices.

There are orders in the market on account of the Northern Mills, which, together with a demand to cover contracts previously made, and a good deal of buying on speculation renders the market strong with a tendency to advance.

The sales reported consist very largely of cotton received from the interior, as the offerings on the Savannah market continue to be very small.

BRITISH COTTON GROWING ASSOCIATION.

The one hundred and fortieth meeting of the Council of the British Cotton Growing Association was held at the Offices, 15, Cross Street, Manchester, on Tuesday, October 5. In the absence of the President (The Rt. Hon. The Earl of Derby, K.G.) Mr. J. Arthur Hutton occupied the Chair.

WEST AFRICA. The cotton which is being grown on the Government Experimental Plot at the Moor plantation is doing well this season, and it is expected that there will be sufficient seed either from the Georgia or Uplands varieties for distribution next season to plant about 500 acres. It was agreed that it would be advisable for the Association to offer a higher price for the cotton produced from this seed, even if it left the Association with a loss, as it is important that the efforts of the Agricultural Department to improve the quality of Lagos cotton should be supported.

It has been decided to close down the Association's operations in the Gold Coast, and at Illushi in the Southern Province of Nigeria. At the same time it is considered advisable to keep open the Ginnery at Labolabo for the benefit of those natives who are already committed to the cultivation of cotton, and it is not anticipated that there will be any difficulty in making arrangements to this effect.

The West Africa Committee have had a meeting with Major Armitage, the Chief Commissioner of the Northern Territories, who reported that cotton cultivation in the Northern Territories was a failure last year owing to the unfavourable climatic conditions, and he expressed the opinion that under better conditions the results would be more favourable. Outside of cotton-growing the only other industry in the Northern Territories of any note, is cattle breeding, and as quantities of cotton seed have been distributed to the local farmers for planting for the new crop, Major Armitage hopes that arrangements may yet be made for the operations to be continued, at any rate for another year, in order to give the farmers an opportunity of marketing their crop.

The purchases of cotton in Lagos to the end of September amounted to 5,974 bales, as compared with 13,486 bales for the same period of last year, and 13,645 bales for 1913.

The purchases of cotton in Northern Nigeria to the end of August amounted to 497 bales, as compared with 518 bales for the same period of last year.

NYASALAND. A report has been received from the Director of Agriculture stating that the crop grown by white planters in the Shire Highlands is above the average, and that some planters have particularly fine crops, which are now being harvested. The River crops are very late, and suffered from drought in February and early March, but late rains have improved conditions considerably. The cotton exported from Nyasaland for the year ended March 31 last amounted to 6,620 bales, valued locally at £72,068, showing an increased value over the preceding year of £6,581.

As regards the native crop, the Mlanje and Upper Shire crops are being harvested, and it is expected that these two districts will produce 350 tons. The native crop is of superior quality, and a sample has recently been received, and valued at 1*d.* 'on' the price of Middling American.

CO-OPERATION BETWEEN COTTON GROWERS AND SPINNERS.

At the recent meetings of the British Association, Mr. W. Lawrence Balls, for some years botanist to the Agricultural Department in Egypt, read a paper on the application of science to the cotton industry. He emphasized the interdependence of cotton growing, spinning, and manufacturing, the great need for co-operation between spinners and growers, and the provision of a language common to both by the scientist. To-day, he said, there was

a big gap fixed between the grower and the spinner. The grower had little idea as to why he could sell some cotton at better prices than he could obtain for other kinds, and the spinner could not explain to anyone but a spinner why he paid more for some kinds than for others. In the past, judgement of quality had been founded upon inspection, but the only real test was the cumbrous one of actual spinning. On the other hand, the scientific study of cotton-growing was wasted labour until enough was known about cotton spinning to understand exactly what was being worked for. It had therefore been suggested that the Manchester University should form a cotton department for the purpose of linking together the scientist and growers and spinners.

Cotton-growing could become an accurate science once it was given an objective by the spinners. For generations past there had been just as much waste as usual in the cotton used by Lancashire, and just as much impurity leading to dirty yarn. There had been no general knowledge of how to alter cotton in any desired direction, and no common agreement as to the connexion between length, productivity, earliness, fineness, and so forth. The distinctions between the kind of seed and the environment in which it was grown had been confused. In spinning mills there had seemed to be no room for further advances in technique, in principle as opposed to detail. We had only to look at a piece of fine cambric or muslin with a small hand lens to realize that this delicate fabric was nothing to be proud of, and was, in fact, a mass of defects with only a fraction of the strength and durability which it might possess if properly made. There was a perfect mine of information waiting to be worked by anyone who would trouble to apply a little thoroughgoing statistical enquiry to such simple points as hair strength and hair length. He himself could see the possibility of two new machines, each marking as big an advance as the comber, and not restricted, like the comber, to the fine spinning trade.

There was a primary need that the spinner should be able to express the properties of his cotton in scientific terms —practically in numerical form—which the grower should understand; and there was ample room for a body which would take upon itself the function of connecting the grower with the spinner, whilst being devoted itself primarily to scientific research. Besides providing a common language for the industry this body could collate the scattered literature and 'illiterature' of cotton, advise and co-ordimate the vague experimental work done disconnectedly in various parts of the world, be a sort of court of appeal as to the significance of results obtained, and keep a register of all the pure kinds of cotton grown, with statistical records of their performance under various conditions in field and mill. He suggested that the University could better fulfil such functions than either a Government department or a business concern.

In the discussion which followed, Sir Daniel Morris said there should be no difficulty in getting growers and spinners to join hands in such a work; Mr. McConnel gave illustrations from his own experiences of how excellent strains of cotton were being lost for want of such work; and the Vice-Chancellor said he had no doubt Manchester University would do everything it could to help forward such a movement if the growers and others in the industry would find the necessary finances. The amount necessary, he added, would be quite negligible as compared with the enormous sums invested in the growing and spinning of cotton, and should be easily raised. (*West India Committee Circular*, October 5, 1915.)

BOTANICAL SOURCES OF RUBBER.

The predominance of *Hevea brasiliensis* as a source of rubber supply is apt to cause some individuals to take an incorrect view of other plants which yield rubber in many parts of the world. The botanical sources of rubber are very numerous and wide-spread. Furthermore, some plants yield considerable quantities of rubber from parts other than the stem. In order to give a concise view of the various sources we have formulated the following:—

1. Classification according to habit.
(a) Rubber trees—Hevea, Manihot, Ficus, Castilloa, Funtumia.
(b) Rubber climbers—Landolphia, Forsteronio, Parameria.
(c) Rubber shrub—Parthenium (Guayule).

2. Classification according to yielding parts.
(a) Stem rubbers—Tree forms—Hevea and Manihot.
Climbers—Landolphia and Parameria.
(b) Root rubbers—Clitandra and Carpondinus.
(c) Stem and leaf—Palaquium (Gutta-Percha).
(d) Whole plant—Guayule.

The above synopsis is given in tabulated form in order to demonstrate the variation in type of plant and different portions of each plant which yield rubber at the present time. Economic developments will probably lead to a diminution in yield from all except the tree-stem rubbers, though we doubt whether any particular insignificant source will ever be entirely obliterated. (The *India Rubber Journal.*)

Tropical Drug Plants.—An account of the drug plants under cultivation in the United States is given in *Farmers' Bulletin*, No. 663, of the Department of Agriculture of that country. Most of the species referred to are adapted only for cultivation in temperate regions, but those referred to as occurring in the Southern States may be worth considering from the point of view of their possible cultivation in the West Indies and the tropics generally. It might be pointed out here that the interruption of trade in synthetic drugs, dyes and other chemicals by the war, has increased the importance and value of natural products.

One of the first groups of plants referred to are the insect flowers from which pyrethyrum or insect powder is prepared. Several species of plants of the aster family are used for this purpose, the best known of which is *Chrysanthemum* (Pyrethyrum) *cineraliaefolium*, which has been cultivated commercially in California for the production of insect powder. Another plant of interest in the present connexion is liquorice (*Glycyrrhiza glabra*), which is described as an Old World plant, the culture of which has not succeeded commercially in the United States, although the plant grows well in the arid South West and in California, where in some localities it threatens to become a weed. Liquorice is used to some extent in medicines, and is said to be much in demand by manufacturers of tobacco. The last two plants to which reference may be made are Stramonium, and cuscus grass (*Vetiveria zizanioides*). The former, which belongs to the genus Datura, is used medicinally, while the latter is collected for its aromatic roots which are often used to impart a fragrance to clothing. In some countries an oil is distilled from the roots and used in the manufacture of perfumes. Yields at the rate of 600 to 1,000 lb. of dried roots per acre have been obtained from cuscus grass. The prices in the market of New Orleans are said to range from 75c. to $1·00 per lb.

EDITORIAL NOTICES.

Head Office — Barbados.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents' and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with the uses and some of the dangers attendant on scientific naming, and the correspondent features of common or vernacular names.

On page 356, will be found a report on the business working of the St. Lucia Government lime juice factory for the crop season June 1, 1914 to March 5, 1915.

Insect Notes, on page 362, deal with the use of starch, instead of lime, with arsenical poisons in regard to pests in St. Vincent. An article is also continued from the last issue of this Journal.

Agricultural investigations in Ceylon during 1914 are described in a review on page 365.

Land for Ex-Soldiers.

The following notice appears in the St. Lucia *Official Gazette* for October 9, 1915:—

'The Government has approved of free grants of land being made to members of the St. Lucia Detachment of the West India Overseas Contingent who return with good discharge sheets upon the following conditions:—

(a) Each grant to be as nearly as possible 5 acres.

(b) No ex-member who has not a good discharge sheet to receive a grant of land.

(c) Every member receiving such a grant must satisfy the Government that he will make good use of the land.

(d) No land so granted to be alienable or mortgageable under a period of twelve years except with special permission of the Governor-in-Council.

(e) Where possible the land so granted shall be in the district in which the ex-members reside.

(f) The lands granted in each district if possible to be in one whole.

(g) Economic plants will be provided free of charge by the Agricultural Department.'

In connexion with the foregoing it will be remembered that the question of land settlement by ex-soldiers was discussed by the Economic Section at the recent meeting of the British Association for the Advancement of Science at Manchester. The idea has many features to support it, and no doubt will be given consideration throughout the Empire.

It may be mentioned that in regard to St. Lucia, the Imperial Department of Agriculture is about to issue a new and revised edition of the pamphlet, Hints to Settlers in St. Lucia, which will no doubt meet with a new and ready demand

West Indian Fruit and the War.

The English papers indicate very definitely that the gifts of West Indian oranges and limes are greatly appreciated in the military hospitals. To show how much the gifts of fruit from Trinidad, Jamaica and Dominica are welcomed, says the *West India Committee Circular*, the Attendant to the Provision Department at the Red Cross depôt at Reading writes: 'I only wish the West Indian planters could see how very much the fruit is appreciated. We are constantly being rung up and appealed to for limes by the different matrons, and the men will leave anything for an orange.'

A cutting from the *Western Daily Press*, just received, states: 'On behalf of the Army Council the West India Committee have now distributed over 6,500 cases of fruit from the Dominica and Jamaica Agricultural Societies, and the Trinidad Orange and Lime Committee. Among recent gifts from overseas have been 40 Imperial gallons of coco-nut oil from Trinidad for our Sikhs' hair, and 1,500 walking-sticks cut from native woods in Jamaica for wounded soldiers.'

The same subject receives attention also in *The World* for September 21, which, in the course of an article on the West Indian Battalions, remarks on the

gifts of sugar, tobacco and fruit; 'the despatch of fruit,' it concludes, 'indeed, never stops.'

From the *West India Committee Circular* it is also learned that limes and oranges are being sent from Trinidad to France.

Ideas of commercial gain are out of place in connexion with these supplies for the wounded, but the fact remains that the present action may ultimately lead to the popularization of the West Indian lime in Great Britain, if not in Europe, and provide us, after the war, with a new market.

Obituary.

We regret having to record the recent death at the age of 42, of Mr. E. A. Agar, owner of the La Haut and Antrim Valley estates, Dominica. Mr. Agar took a keen interest in the agricultural development of Dominica, and occupied several honorary positions including that of Secretary of the Planters' Association, Member of the Permanent Exhibition Committee, and Correspondent of the West India Committee.

Mr. Agar died on October 22. His funeral was attended by His Excellency the Governor of the Leeward Islands, and His Honour the Administrator of Dominica.

We also have to announce the death of Mr. F. R. Capello, of St. Kitts, who died on October 19, after an operation. Mr. Capello was closely associated with the cotton industry of St. Kitts, and will also be remembered as an energetic member of the local turf club.

Coloured Cotton.

Mr. R. Forster Parkinson, of Barbados, has furnished us with a cutting from the *New York Times* containing an American article on coloured cotton. This states that a planter in South Carolina has succeeded in producing cotton which ranges in colour from snow white to a deep olive green. It is asserted that black cotton, sought for ages by spinners and manufacturers, is about to become a reality. The planter's statements are borne out by the receipt in Savannah of samples of his coloured cottons. The exhibit has been framed and hung on the walls of the Cotton Exchange, where it has occasioned a great amount of interest and comment.

The seed used in the experiments were those of Egyptian staple. Seed selection has been practised extensively, and in four years this grower has obtained in regular order from the Egyptian seed a cream, tan, yellow green, light brown, olive green, and bronze. It is believed that the attainments which have thus far been achieved, warrant the assertion that black cotton is coming in the near future.

It is believed that the spinners and manufacturers will eventually be enabled to obtain cotton in the raw or unmanufactured state in any desired shade or colour.

We would advise our readers to refrain from giving credence to the above until such time as the matter may receive the official attention of the United States Department of Agriculture.

Damage to Crops in Dominica by Storm of August 10.

Reference to the damage caused in the Botanic Gardens, Dominica, was made in the *Agricultural News* for September 25, and to the nature of the storm in the last issue (October 23). This note concerns the extent of such losses as have been experienced on the estates referred to tentatively under 'Down the Islands' for September 25. It appears from a report on a tour made by the Assistant Curator (Mr. G. A Jones), that altogether about 10,000 trees, distributed over a number of estates, were blown over, but that the majority of these have been put back and propped in an upright position, and may be expected to recover.

The policy adopted by the majority of planters in this matter of propping is advocated in the I.D.A. pamphlet on Lime Cultivation and was reproduced in the editorial to this Journal for August 28. In some cases, after the storm referred to, the practice of 'stumping' was employed. This consisted in cutting back the trees to within 3 or 4 feet of the ground. Mr. Joseph Jones, the Curator, considers this an unnecessarily drastic measure; but, as Mr. Nowell, the Mycologist to this Department points out, it is always desirable eventually to cut off the old top after the new growth has become active. Naturally the loss occasioned by storm damage depends largely upon the extent to which the roots have been displaced, and the whole question of reparation calls for careful examination and sound judgement.

It will be useful to know what success has resulted from the efforts to re-establish the damaged lime trees by the methods referred to by Mr. Jones. The information should be a valuable guide to procedure in future years.

St. Lucia Agricultural Credit Ordinance.

The St. Lucia *Official Gazette* for October 1 contains a copy of an Ordinance assented to by the Governor of the Windward Islands, for the registration, encouragement and assistance of agricultural credit societies under the Raiffeisen system. Comparison with the St. Vincent Act of 1913 (see *West Indian Bulletin*, Vol. XIV, No. 1) will show that the provisions of the two Acts are virtually the same with the exception that in the St. Lucia Act the Government may make loans provided the loans to the societies in the aggregate do not exceed £3,000. In the St. Vincent Act the limit allowed is £500. Further, the amount of the loan to any one society in proportion to every member is raised in the St. Lucia Act to £6; in the case of St. Vincent it is £5.

The introduction of the St. Lucia Act is an indication of the spread of agricultural credit facilities in the West Indies. Reference has recently been made in this Journal to the new Trinidad Ordinance, which is also a result of the St. Vincent experiment. The development subsequent to and consequent on the above legislation will be followed with interest.

INSECT NOTES.

STARCH, INSTEAD OF LIME, WITH PARIS GREEN.

The attention of planters in St. Vincent has been directed by Mr. W. N. Sands, the Agricultural Superintendent, to the following description of new methods devised, and the results of investigations and experiments made, by the Agricultural Department at the Experiment Station and on estates, which have led to the discovery of cheap and efficient means of destroying certain 'worms' attacking staple crops in St. Vincent.

Mr. S. C. Harland, B.Sc., the Assistant Agricultural Superintendent, who has had charge of the work during the past four months, has written the following important memorandum, containing results which may have a wide application in tropical agriculture:—

In May of this year it became important, in view of the proposed extension of Indian corn cultivation in the Colony, to devise methods of controlling the corn worm (*Laphygma frugiperda*). While working on this subject it was discovered that, if the arsenical poisons, Paris green and lead arsenate, were diluted with low grade arrowroot starch which had been put through a sieve of eighty meshes to the inch, a mixture was formed which seemed to have a peculiarly deadly effect upon all kinds of caterpillars. The greater effectiveness of these mixtures, as compared with similar lime mixtures, is thought to be due to the fact that insects usually avoid vegetation where lime is present, and refrain from eating it until actually forced by hunger. A longer period of time thus elapses before the poison is taken in than in the case of starch mixtures, where feeding goes on at the same rate as before. Greater dilution is thus possible with starch mixtures, and the cost of applying poison becomes proportionately less. Additional advantages are—(a) starch adheres better to leaves than lime, (b) it is insoluble in water, (c) it is more pleasant to sift.

CONTROL OF THE CORN WORM.

The corn worm (*Laphygma frugiperda*), known in British Guiana as the 'rice worm' and in the Southern States of America as the 'fall army worm,' as the most important pest of corn in St. Vincent. The life-history has been worked out at the Experiment Station, and this has assisted greatly in the work of devising means of control.

The following points in the life-history are important:—

(1) The eggs, fifty to 350 in number, are laid usually on the back of the leaf, in a cluster. They are easily seen, and thus one of the best ways of combating the pest is to collect the eggs before they hatch. At present, however, 300 clusters of eggs per day are being collected at the Experiment Station from $\frac{1}{2}$-acre of corn, so that the cost of hand collecting over a large area would become a serious item.

(2) The young larvae remain quiescent for a time after hatching and then migrate to the heart of the young plant, where they immediately begin to eat. Fortunately they have cannibalistic tendencies, and prey upon each other to such an extent that it is rare to find more than two full-grown larvae in a single plant.

(3) This habit of remaining in the heart of the plant is made use of, in that it is necessary to put poison in this particular place only. Applying the poison with ordinary dusting apparatus is not economical. The practice followed at the Experiment Station is to drop a small quantity of poison into the heart of each plant, using an ordinary pen nib.

TRIALS WITH VARIOUS POISONS.

The following combinations have been used in the experiments, and short notes on each are appended. The proportions are by volume:—

Lime. Burns the leaves severely, but seems to destroy the worms if it comes in contact with them.

Lime and Paris green (1:6) Worms destroyed but leaves severely damaged.

Lime and Paris green (1:20) ditto.

Lime and Paris green (1:60) ,,

Starch and Paris green (1:6). As above but acted more rapidly.

Starch and Paris green (1:20). Worms dead within twenty-four hours and the damage to the leaves is considerably less than with the 1:6 mixture.

Starch and Paris green (1:100). Worms dead within forty-eight hours. Damage to leaves is still apparent, but the plants quickly recover.

Starch and lead arsenate (1:20). Worms dead in twenty-four hours. Damage to leaves slight.

Starch and lead arsenate (1:30). Worms dead in twenty-four hours. Damage to leaves negligible.

As both Paris green and lime separately and together burn the leaves of corn severely, they cannot be used against the corn worm.

A mixture of lead arsenate and starch in the proportion of 1 part of the former to 30 parts of the latter is recommend for the control of the corn worm on young corn.

The 1:100 mixture of Paris green and starch can be used on half-grown plants.

It will be seen that a cheap and efficient method of combating the corn worm has been discovered.

THE 'FALL ARMY WORM' IN BEQUIA.

In the months of June and July great damage was done to crops in Bequia by the 'fall army worm' or a variety of it. The pest did not confine itself to corn but attacked most growing crops. A 1:60 mixture of Paris green and starch was used with great success.

THE ARROWROOT WORM (*Calpodes ethlius*).

At certain times of the year in St. Vincent, arrowroot fields are attacked by the arrowroot worm and often completely defoliated. Opinions among planters differ as to whether any great difference is shown between the produce of attacked and unattacked cultivations. One would imagine that, as the starch is elaborated in the leaves, any check to the latter would result in a corresponding reduction of the quantity of starch stored in the root. This question will be settled by experiment as soon as practicable.

Meanwhile it is useful to know that the arrowroot worm can be destroyed by the 1:60 Paris green starch mixture. Three hours after the poison was applied to a plot of arrowroot it was evident that some of the larvae were dying. In less than twelve hours, 90 per cent. of them were dead. One application only was necessary.

THE GROUND NUT WORM (unidentified species).

At Ratho Mill estate ground nuts were severely attacked by the larvae of an unidentified geometrid moth, and considerable areas were completely defoliated. An application of the 1:60 Paris green and starch mixture checked the attack in two days.

THE COTTON WORM (*Alabama argillacea*) AND BRONZE BEETLE (*Colaspis fastidiosa*).

There has not been a serious outbreak of cotton worm so far this season, and an opportunity has not presented itself of trying the effect of the mixture above described on this worm, still there is no doubt but that it would prove effective. In the case of the bronze beetle which attacks cotton leaves, the poison has been successfully used against it.

CONCLUSIONS.

These experiments show that mixtures of arsenical poisons with starch are extremely valuable in controlling outbreaks of worms; they are cheaper* than the lime mixtures usually employed, and are more deadly.

INSECT PESTS OF LIMA BEANS IN ST. VINCENT.

The following notes, by Mr. S. C. Harland, B.Sc., constitute a continuation of those which appeared in the last issue of the *Agricultural News*:—

THE BEAN LEAF-ROLLER (*Eudamus proteus*, L.).

A general account of this insect is to be found in Insect Pests of the Lesser Antilles (Ballou). The larval parasite *Urogaster leucostigma*, Ashm., has been reared in St. Vincent, but it is not at all common. Three species of Chalcid flies have been obtained from the eggs, one large, and two small. It is thought that the larger fly is a primary parasite but that the others are hyperparasites, and therefore to be viewed as harmful. In view of these natural enemies it is probable that Lima beans will not suffer very seriously from this pest.

Food Plants. The bean leaf-roller has been observed to feed upon the following other plants: *Desmodium incanum* (a common leguminous pasture weed), *Clitoria* sp., cowpeas (*Vigna catjang*), and bonavist bean (*Dolichos lablab*).

THE LIMA BEAN LEAF-BLOTCH-MINER.

Lima beans are attacked extensively by an undetermined blotch-miner, which is possibly a species of Agromyza.

Life-history. The life-history of the miner has not been fully worked out, but some information has been gained as to its habits.

The Egg. The egg has not been seen, but as many as nine may be laid in a single leaf.

The Larva. In colour the larva is pale greenish white, and is semi-transparent. The dimensions when mature are about 3 mm. long by 1 mm. broad. The length of the larval period is about six to nine days. When full-grown the larva bites a hole through the epidermis and enters the ground to pupate.

The Pupa. The pupa is about 3 mm. in length and 1·5 mm. in breadth. It is oval in shape, and is of a reddish brown colour. The segments can be seen quite clearly. The length of the pupal period is about thirteen days.

The Adult. The adult is a stoutly built dipterous fly about 3 mm. long.

Parasites. The pest was very abundant in the latter part of August and a Chalcid fly was reared from the pupae.

Control. The blotch-miner must be regarded as a major pest in the control of which ordinary methods would seem to find little application. Many plants had more than 30 per cent. of their leaves attacked, and since each larva is capable of destroying almost half a square inch of tissue, it is evident that the metabolizing power of the leaves must be seriously reduced. No suggestions for control can at present be made, and it is hoped that the pest will be kept in check by its parasites at certain seasons of the year.

A NEW CATERPILLAR.

Lima beans are attacked by the larvae of an unidentified moth. The caterpillar is greenish in colour, is semi-transparent, and possesses the leaf-rolling habit. A full life-history has not been worked out, but the length of the larval stage appears to be about eight to nine days, and that of the pupal period six to seven days. Pupation takes place in a fold of the leaf. The moth measures about 15 mm. across the wings and is golden brown in colour, with a few darker markings.

Host Plants. *Clitoria* sp., bonavist (*Dolichos lablab*), cowpeas (*Vigna catjang*, var.), Bengal beans (*Stizolobium aterrimum*), woolly pyrol (*Phaseolus mungo*), Lima bean (*Phaseolus lunatus*).

Parasites. The pest completely disappears at certain seasons of the year. This is due to the fact that several parasites exist in St. Vincent. The following have been reared, but have not been identified:—

(a) Two Chalcid parasites of the larvae.
(b) A Braconid parasite of the larvae.
(c) A Chalcid parasite of the pupae.

Control. During the greater part of the year the pest is controlled by its parasites, but at certain times becomes very numerous, and eats Bengal beans to the ground. At these times Lima beans would certainly suffer badly. A mixture of starch and arsenate of lead in the proportion 30 to 1 is a good means of control.

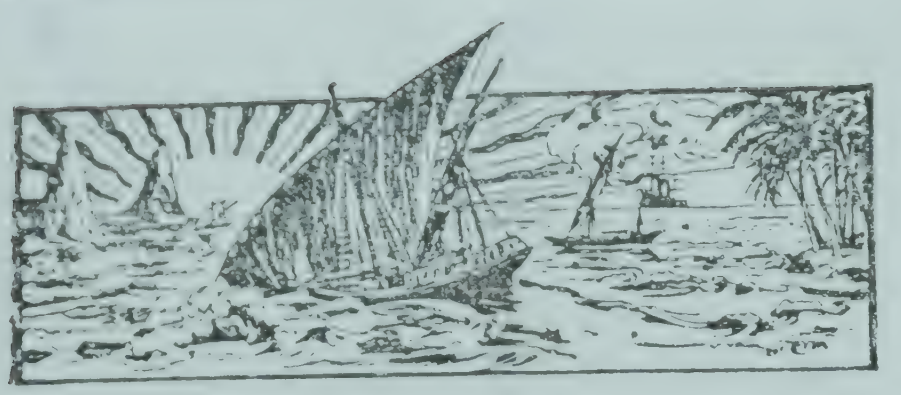
SUMMARY.

Four pests of Lima beans in St. Vincent are described in a popular manner. Of these the first, third and fourth are probably major pests. The second is held in check by its parasites. Methods of control are suggested for the Cryptorhynchus borer and the last mentioned caterpillar.

Variability in the rate of cure of rubber is, according to Mr. Lewton Brain and Mr. B. J. Eaton of the Department of Agriculture, Federated Malaya States, caused by a difference in the quantity or quality of certain non-caouchouc constituents of the latex, which remains in the rubber after coagulation. There may be other factors, but the one mentioned is considered the most important. The subject referred to is fully dealt with in the *India Rubber World* (October 1, 1915), in that interesting section 'What The Rubber Chemists are Doing.'

The house centipede, although disagreeable in appearance, feeds on small cockroaches, the typhoid fly, and other still more disagreeable insects, and therefore would not seem altogether an undesirable visitor in one's house. However, as one of the Federal Department of Agriculture's Entomologists says in a recent *Farmers' Bulletin* (No. 627) dealing with this insect, its uncanny appearance is hardly calculated to inspire confidence, and it will unquestionably bite in self-defence. It does not feed on household goods and woollens, although many housewives hold this belief.

*. In St. Vincent, madingo or low grade arrowroot starch can be obtained at from 10*s.* to 12*s.* per 200 lb., and the lowest grade cassava starch at 4*s.* 2*d.* per 100 lb.



GLEANINGS.

In the *Louisiana Planter* for October 2, a discussion appears concerning the amount of bone-black required for refining good quality plantation sugar.

We learn from the *Veterinary Record* for September 11, 1915, that Mr. P. T. Saunders, M.R.C.V.S., formerly on the Staff of this Department, after a year's probation, has been confirmed in rank as Lieutenant in the Army Service Veterinary Corps.

Previous to the war successful efforts had been made to build up a market for Porto Rican fruit in France and England. The restricted steamship facilities, however, have now restricted shipments particularly of grape-fruit. (*Modern Cuba*, September 1915.)

We have received the *Yearbook of the Royal Colonial Institute* for 1915, which is principally composed of a list of the Fellows, of which there are many hundreds in number. This publication also contains a useful list of the papers and journals published in the Colonies and Dominions.

The way to improve silk reeling in Bengal is described in *Bulletin No. 44* of the Agricultural Research Institute, Pusa. It has been found that by the provision of two small pulleys to the ordinary Bengal type of reeling machine, superior thread can be obtained, while the cost of the extra apparatus is merely nominal.

According to results obtained at the Northumberland County Agricultural Station, salt is not required for fattening cattle or sheep fed indoors at that institution. It looks as if the food fed in the experiments must have contained a sufficient amount of salt to render unnecessary the addition of any extra quantity.

The production of sugar is perhaps the most important industry of the Dominican Republic. It is stated in *The Board of Trade Journal* (September 16, 1915) that from the 1913-14 harvest 106,427,594 kilogs. (kilog. = 2·2 lb.) of sugar were manufactured, and of this amount 10,997,936 kilogs. were kept for home consumption.

The attention of bee-keepers in the tropics may be called to *Bulletin No. 46* of the Agricultural Research Institute, Pusa, which deals with bee keeping in India. Some account is given of Indian bees and of the modified form of standard frame-hives which has been found practically useful with apiaries in India for *Apis indica*, the only Indian wild bee which it is possible to domesticate.

A useful table showing the proportion of ash and potash in various tropical plants appears in the *Tropical Agriculturist* for July 1915. It is worth noting that young red leaves and twigs of cacao and dry coco-nut husk are remarkably rich in potash, while *Pithecolobium Saman*, the pods and leaves of which are often a constituent of vegetable mulch, are very poor in potash.

According to a statement in the Colonial Report for 1914 on Sierra Leone, the lime cultivation at Java is now two years old. The trees, which have grown exceedingly well, are stated to compare very favourably with three-year old plants in the West Indies. It is believed that, if properly organized, the production of limes could be made a lucrative industry in Sierra Leone.

Fourah Bay in Sierra Leone has the distinction of being the only University College in West Africa. At the end of 1914 there were names of twenty-five students on the College Roll, while the number who matriculated during the year was ten. This College was affiliated to the University of Durham shortly after the affiliation of Codrington College, Barbados, to the same University in 1875.

The *Canada-West India Magazine*, in its issue for September 19, 1915, hastens to point out in connexion with attempts to grow beat in England, that this source of sugar is not likely to develop in Canada. Neither the Canadian climate nor the state of the Canadian labour market is favourable to the production of sugar beet. The West Indies should look to Canada to a greater and greater extent as a market for their sugars.

A useful table appears in the Thirty-Fifth Report of the Comptroller of Customs of British Guiana, showing the exports of sugar from that colony to England, Canada, and America, and elsewhere during the past thirty years. The record shipment was made in 1903-4 when 135,949 tons were shipped as against 77,821 in 1912. The reduced output for 1912 and 1913 was due to drought. There is a possibility that the 1915 crop, owing to a better season, will be a record one.

According to recent research, the common domestic fly is a carrier of leprosy. After visiting the sores of patients, the fly is believed to play an importont part in disemminating the disease by depositing excrements on the mucous membrane or small abrasions of the skin of healthy people living in the immediate vicinity of lepers. It is believed that the house-fly is merely a mechanical transmitter, and that it is not in any sense a true intermediate host like the mosquito is in regard to malaria.

A useful method for loading hogs in a cart or train is described in the *Journal of the Department of Agriculture of Victoria* for August 1915. A crate without a floor is used, which is placed over the hog or else the hog is let through the door at the end. Two plants 10 to 12 feet long are used, one end resting on the end of the wagon-box, and the other on the ground. The crate is then slid up the planks with the hog walking backwards. As the crate touches his nose, the animal will readily back up the planks into the wagon. A rope is then passed over the crate by means of which it is fastened down.

CEYLON: REPORT OF THE DEPARTMENT OF AGRICULTURE FOR 1914.

The Ceylon Department of Agriculture, costing the Government some £24,000 annually, is a large organization which gives its attention to a variety of problems pertaining to the agricultural progress and development of the colony. The Report of the Director (Mr. R. N. Lyne) has recently come to hand. It begins by describing the work that is being done in connexion with coco-nuts: this consists principally in manurial and cultivation experiments. The former are designed to show the influence of mineral constituents on the yield of nuts and upon the upbringing of a young plantation on poor sandy soil, while the cultivation experiments largely concern the influence of cultivating the land under coco-nuts and keeping it stirred with the hoe (dry-farming). Although most of the manurial experiments have not yet been in progress long enough to permit of definite conclusions being drawn, there are strong indications that manuring will be found profitable, especially in the case of old trees which tend to shed their nuts in an immature state. The result of manuring and cultivation has been to raise the yield from an average of twenty-six nuts per tree in 1911 to thirty in 1913, the unmanured plots declining from twenty-seven to twenty-three. These particular experiments referred to, further show that ploughing twice a year is as beneficial as manuring. Lastly, the cultivation experiments in the dry zone district demonstrated the important fact that with intelligent husbandry the effect of a long dry season can be counteracted.

A great deal of interest, it is stated, has been devoted by the press and the public to the circumstances of rice cultivation in Ceylon. Experiments conducted by the Department of Agriculture seem to show that the seeding in Ceylon is too heavy; but, as pointed out elsewhere, the cultivator probably has good unconscious reasons for his thick sowing.

The work done during the year with tobacco is chiefly interesting because it is new. With an idea of finding a European outlet for Jaffa tobacco, which cannot be sent as formerly to India on account of prohibitive import duties, the Department of Agriculture has engaged the services of Mr. Scherffius, a tobacco expert.

At Peradeniya there is a good collection of varieties of coffee, including *Coffea arabica*, *C. robusta*, *C. canephora*, *C. liberica*, and Uganda coffee. Judging by the demand for seed, coffee would appear to be slowly re-establishing itself as a staple crop. Mr. Lyne says that the seed most in demand is *C robusta*, for it suffers very little from leaf disease, and is a prolific yielder. *C. canephora* has also yielded well.

Considerable prominence is given to the subject of School Gardens in the report under review. This is not only because the gardens themselves are being satisfactorily worked, but also because School Gardens in Ceylon constitute a valuable medium for the distribution of seed and information to the native population. During the past year the Gardens as distributing agents were very strikingly demonstrated at the time when it became necessary, on account of war conditions, to make arrangements for the planting of large areas under food crops.

Turning more particularly to matters of agricultural research, reference is made first to Mr. Campbell's work on rubber in collaboration with the Imperial Institute. This deals with vulcanization largely, and the results are not yet ready for publication. Another matter concerning rubber which has been studied, is the movements and storage of plant food in Hevea, and the cause and origin of nodules on the same tree. The results of the former investigation have already been noted in this Journal, and concern the local effects of tapping on the tree.

Mycology and Entomology are represented by work on a root disease of the plantain, which has not yet been conclusively investigated, and the shot-hole borer of tea, and the red weevil of coco-nuts. In connexion with the shot-hole borer, infested estates are by law declarable by the Director of Agriculture as being in quarantine. In connexion with the red weevil it is said that this pest has given much trouble: various remedies have been tried, but the Department has had to fall back on the crude treatment of cutting away the destroyed tissue wherein the grubs are found, and tarring the wound.

Soon after the outbreak of war, says Mr. Lyne, considerable alarm arose amongst Ceylon planters when it was realized that supplies of acetic acid, used in the coagulation of latex, almost all of which came from Germany and Austria, were likely to run short. Mr. Campbell, who was at that time Acting Government Chemist, and who is now on active service, immediately began investigating the question of being able to provide acetic acid or some substitute locally, and numbers of private investigators also set to work on the same problem. Cacao juice, coco-nut water, and coco-nut vinegar were all found to be suitable coagulents, especially coco-nut water, which is now being regularly used on some rubber estates. At Peradeniya pyroligneous acid from the destructive distillation of wood and of coco-nut shells was produced by an improvised still, and the results made public. Supplies of acetic acid soon began to arrive from England, Mr. Lyne states, and the urgency of the question passed; but results which will probably prove of permanent benefit to the island were obtained. Acetic acid can be made cheaply and in ample quantity from coco-nut shells. It is not sufficiently clear in colour for first latex crêpe, but good, clear smoked sheet can be and is being made in large quantities with it. Mr. Lyne states that Ceylon produces enough coco-nut shells to provide sufficient acid for all the smoked sheet made in the island—perhaps in the whole East—and the cost of acid works out at much less per pound of dry rubber with crude acetic acid from coco-nut shells than with the imported products.

A brief note must suffice in referring to the commercial side of Ceylon's principal industries. Naturally the war affected adversely, for a time at least, the coco-nut, rubber, cacao and tea trades, but, on the whole, the recovery has been satisfactory. The stability of the rubber industry has been greatly increased by an all-round decrease in the cost of production. On some estates rubber is being produced at an all-in cost of 7*d.* per lb. and even less. In such cases good profits could be realized if first grade rubber were selling only at 1*s.* per lb. instead of 2*s.* 6*d.*, which is nearer the usual price.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. The Agricultural Superintendent (Mr. W. N. Sands) informs this Office that during September he made a tour of estates in the Leeward District, while the Assistant Superintendent visited the Windward District to investigate cotton and cacao pests and diseases. In regard to education, two further meetings were held with the Inspector of Schools to discuss a scheme for agricultural teaching in the primary and secondary schools. The science classes have been re started at the Grammar School. Turning to the subject of staple crops, it is reported that the general condition was fair. There has been a good deal of boll shedding of cotton on some estates owing to the heavy rains, and the angular leaf-spot disease has also done some damage. Taken as a whole, the season so far, has not been unfavourabe for crops in most districts. The work with pests and diseases has been energetically continued by the Department, as will be seen by referring to Insect Notes in this issue of the *Agricultural News*. On September 7 a visit was paid to St. Vincent by the Imperial Commissioner of Agriculture, who inspected the Botanic and Experiment Stations and Government Cotton Ginnery, and discussed with the Administrator and Agricultural Superintendent, matters connected with corn, cotton and other industries of the colony. Dr. Watts is expected to pay another visit to St. Vincent in December.

DOMINICA. Mr. Joseph Jones (the Curator and Agricultural Superintendent) writes to the effect that the present year's lime crop is not likely to be as big as that of last year. Progress in relation to the lime industry is to be seen in the erection of four new steam concentrating plants, which are now working satisfactorily. A trial run by one of these indicated that the loss of acid when concentrating to a test of 110 to 115oz. per gallon is not more than 2 to 3 per cent., which confirms what has already been demonstrated at the Government Lime Juice Factory in St. Lucia. During the month, a large number of estates were visited in connexion with the recent storm. An account of the observations made on this tour will be found on another page in this issue. Work in the nurseries during September consisted in lifting and delivering plants, potting, transplanting, budding, sowing seeds, and spraying. In the lime experiment station as well as in the cacao station, the picking and recording of the crop was carried on. The rainfall for the month of September was 11·36 inches. There was a gale of considerable severity on September 22, but by no means as severe as the hurricane of August 10. A considerible amount of fruit has been shipped to England for the use of wounded soldiers in the different hospitals.

MONTSERRAT. Mr. Robson, the Curator, of the Botanic Station, refers in a recent communication to the new papaw experiment plot containing eighty plants of the self-fertilizing Hawaiian type. Experiments are in progress with a view to controlling the 'damping off' disease of onion which has occasioned some trouble. In regard to cotton, Mr. Robson thinks that the continued good weather will ensure a crop above the average. The selection of cotton continues to take up a good deal of time, but it is believed that ultimately a finer type of cotton will be produced in the island than at present. The cultivation of ground nuts has attracted the attention of planters, and it seems possible that an export trade with Canada in the Virginia Running type, valued at 7c. per lb. may be established. During September, three candidates signified their intention of sitting for the preliminary examination in Practical Agriculture conducted by the Imperial Department of Agriculture. During the month the weather was showery, but did not interfere with cotton picking to any extent.

ANTIGUA. According to Mr. J. Jackson the cane crop continues to improve, though in some places rain is required. The germination of the recently imported onion seed has been good but some estates have lost fairly large quantities of seedlings by 'damping off'. During September the Government granary was working and 86,000 lb. of corn was purchased. The corn dried amounted to 68,992 lb., while 5,824 lb. were sold. The new corn meal maker was erected. It is noted that two meetings of the Insurance Committee and a general meeting of the Agricultural and Commercial Society were held during the month. Fairly good weather has been experienced

NEVIS. In the Experiment Station Mr. W. Howell states that the growth of Lima beans has been satisfactory, and that plots were prepared for onions and Indian corn. Observations relating to staple crops show that the cane crop is promising, while the returns from cotton are said to be very poor. The reduced yields are to some extent the result of rough weather experienced in August. The rainfall for the month was 4·71 inches at the Botanic Station.

VIRGIN ISLANDS. The Experiment Station at Tortola continues to be the scene of considerable activity though some of the experiment plots have suffered on account of the continued dry weather. Writing at the end of September, Mr. G. A. Gomes refers to the efforts being made to raise onion seedlings as speedily as possible. During the month 225 barrels of limes were received and the juice concentrated, and 26 bales of cotton were shipped to England. The prospects for this last named crop have, it is stated, become worse, and it is difficult to say whether the receipt of rains can ever save the situation now. In the cane fields, also because of dry weather, the plants are showing signs of wilting. The young coco-nut fields have withstood the dry months satisfactorily. Amongst the meetings of agricultural interest was a large gathering in connexion with inaugurating an Onion Growers' Association, which has since been finally established, as reported in the last issue of the *Agricultural News*

It is recorded in *Nature* for September 30, 1915, that the results of the measurements of the deviation of the magnetic compass from true north made on the magnetic survey ship 'Carnegie', during her voyage from Brooklyn to Honolulu via the Panama Canal, show that in the nieghbourhood of the passage between Dominica and Porto Rico, the present British Admiralty Chart gives the westerly deviation more than a degree too small. This should be of importance to navigators in these waters.

The farming train is now a regular feature of agricultural demonstration work in Canada and the United States. It is stated in the *Agricultural Gazette of Canada* (September 1915) that this year both the Canadian Pacific and Northern Railways provided trains for the use of the Department of Agriculture. The trains consisted of sections devoted to live-stock, crop production, and household science. In connexion with the latter, a class of women students is carried on the train, and in cases where there is a family to be looked after, the children are also conveyed on the train and carefully attended to and entertained in a special nursery, while their mothers enjoy the lectures and demonstrations.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of September:—

As the auction records for the month of September cover a period of five weeks commencing on September 2 and ending on the 30th, a wider range of business than is usual comes under review in these notes. The month started with very little change, either in demand or prices, from our report for August, though the tendency with buyers to withhold large orders, was apparent, it being felt that the maximum was already reached. In some instances the plentiful supplies brought forward had a tendency to lower prices, while, on the other hand, the large supply of West Indian nutmegs, as will be seen from the details following, realized advanced prices. In consequence of the increase in the sugar duties it is anticipated that there will be a general rise in prices of all articles in which sugar enters into composition.

GINGER.

At auction on the 8th of the month, no West Indian was brought forward, but there was a large supply of Calicut. Seven hundred packages were bought in, but 40 of unassorted, slightly wormy, native cut Calicut were sold at 52*s.* 6*d.* A fortnight later, namely on the 22nd, the offerings, which consisted of 325 packages of Calicut and Cochin, were again bought in at the following rates: plump Calicut 65*s.*, native cut unassorted 28*s.*, and washed rough Cochin 30*s.* At the last auction, on the 29th, the figures stood as follows: medium Jamaica 60*s.* to 65*s.*, and good common 55*s.* to 59*s.*; fair Cochin 26*s.* to 26*s.* 6*d.*; ordinary Calicut 26*s.* to 28*s.*, and washed 30*s.*

NUTMEGS, MACE, AND PIMENTO.

At the spice auction on the 8th there was a very large supply of nutmegs amounting to 1,189 packages of West Indian, which met with a good demand at a farthing per lb. advance over previous rates. On the 22nd of the month, 805 packages West Indian were again offered and sold, 90's fetching $5\frac{1}{2}d.$, and slightly wormy $2\frac{1}{2}d.$ to 5*d.*

Mace was in abundant supply during the month. At the auction on the 8th as many as 470 packages of West Indian were brought forward, all of which were disposed of, fair to good bold pale fetching 2*s.* to 2*s.* 7*d.* per lb., red fetching 1*d.* to 2*d.* per lb. cheaper than previous rates, and pickings 2*d.* to 3*d.* per lb. less. At the last auction, on the 22nd, 261 packages of West Indian were sold at from 1*s.* 4*d.* to 1*s.* 9*d.* per lb., the former for ordinary to good broken, and the latter for fair palish. At the beginning of the month pimento sold at $1\frac{5}{8}d.$ per lb., but at the last auction, on the 22nd, sales were effected at 2*d.* per lb.; 143 bags, however, were bought in at $2\frac{1}{8}d.$ per lb.

SARSAPARILLA.

There has been but very little demand for this drug during the month. On the 9th the offerings were as follows: Grey Jamaica 50 packages, native Jamaica 33, Lima-Jamaica 4, and Honduras 15. No buyers were found for any of these except the native Jamaica, and of this only 3 bales were disposed of, two of which fetched 1*s.* 1*d.* per lb. for fair red, and for the remaining bale of dull pale and red mixed, 10*d.* per lb. was paid. Quite at the end of the month it was stated that grey Jamaica was obtainable in small lots at 1*s.* 10*d.* per lb.

ARROWROOT, CITRIC ACID, KOLA, ANNATTO, CASHEW NUTS, LIME OIL, AND LIME JUICE.

The quotation for St. Vincent arrowroot during the month has been $2\frac{5}{8}d.$ to $2\frac{7}{8}d.$ per lb. for manufacturing quality, and 4*d.* to $4\frac{3}{4}d.$ for fine. Citric acid at the beginning of the month was fetching 3*s.* 2*d.* per lb. but towards the end it could be had for 3*s.* 1*d.* At the beginning of the month kola was scarce, $7\frac{1}{2}d.$ per lb., being asked for good Java. At auction on the 9th, however, some good bright African from Zanzibar sold at $6\frac{1}{2}$d., and 11 bags from Ceylon realized $6\frac{1}{2}d.$ to $6\frac{3}{4}d.$ for dull bold to good bright. At the last auction, on the 30th of the month, as many as 50 bags of dried African were sold at 7*d.* per lb., and for a quantity of West Indian 6*d.* to $6\frac{1}{2}d.$ was quoted. Annatto seed was represented in large quantity at auction on the 11th, some 318 packages from Java being offered, for which 5*d.* to 6*d.* per lb. was asked. At the sale on the 23rd these seeds were to be obtained at $4\frac{1}{8}d.$, and for a quantity from Madras $6\frac{1}{2}d.$ to 7*d* was asked. Some 140 packages of cashew nuts were offered at auction on the 9th of the month, only 15 of which found a buyer at 15*s.* 6*d.* per cwt. for a lot that was badly weevilled. At auction in the early part of the month, 6 packages of good distilled oil of limes from Dominica were disposed of at 7*s.* 6*d.* per lb.; a week later 24 cases, also from Dominica, were offered at from 9*s.* to 10*s.* per lb. In consequence of this large quantity being put upon the market, the price dropped to 8*s.* to 9*s.*, and quite at the end of the month it was obtainable at 7*s.* 3*d.* to 7*s.* 6*d.* per lb. At auction on the 22nd of the month, some 18 casks of lime juice from St. Lucia were offered, and bought in at 3*s.* per gallon. It was stated that for good Jamaica 3*s.* 9*d.* per gallon was demanded.

CULTIVATION EXPERIMENTS WITH GROUND NUTS.

The results of the experimental work at the Botanical Station at Salisbury in Rhodesia include the following connected with the cultivation of ground nuts. The results are published in the *Rhodesia Agricultural Journal* for August 1915:—

Variety Trials.—Average yield of all varieties, 790 lb. per acre. Highest yield: Tennessee Red, 940 lb. per acre. Earliest maturing varieties: Spanish, $4\frac{1}{2}$ months; Tennessee Red, 5 months. Latest variety: Virginia Runner, $6\frac{1}{2}$ months.

Distance of planting.—Plants 30 inches by 12 inches gave a yield of 732 lb. per acre.

Distance of planting.—Plants 30 inches by 8 inches gave a yield of 864 lb. per acre.

Method of planting.—Whole nuts cracked were planted in hills 30 inches by 12 inches, and shelled nuts two in each hill were planted at the same distance apart.

Whole nuts cracked gave a yield of 756 lb. per acre.

Shelled nuts two kernels in each hill gave a yield of 656 lb. per acre.

Early *versus* late planting.—North Carolina planted 3/12/14 yielded 798 lb. per acre.

Early *versus* late planting.—North Carolina planted 5/1/15 gave a very low yield.

Repeated experiments have shown that early planting is essential for this crop.

Seed required per acre.—With the Spanish variety one bag of unshelled nuts, weighing 80 lb., sufficed to sow 3 acres at the rate of one nut per hill, rows 30 inches apart, with 9 inches between the plants.

MARKET REPORTS.

London.—The West India Committee Circular, September 7, 1915.

Arrowroot—2*d.* to 4¾*d.*
Balata—Sheet 2*s.* 4½*d.* to 2*s.* 5*d.*; block 1*s.* 9*d.*
Beeswax—No quotations.
Cacao—Trinidad, 81/- to 85/- per cwt.; Grenada, 76/- to 80/-; Jamaica, 72*s.* to 73*s.*
Coffee—Jamaica, no quotations.
Copra—245*s.* to £24 15*s.* per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 13*d.* to 16*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 55/- to 75/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/8 to 3/9; concentrated, £30; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—9*d.* to 2/11*d.*
Nutmegs—4¼*d.* to 5¾*d.*
Pimento—No quotations.
Rubber—Para, fine hard, 2/4½; fine soft, 2/3; Castilloa, 2/1½.
Rum—Jamaica, 4/2 to 4/9

New York.—Messrs. Gillespie Bros. & Co., October 12, 1915.

Cacao—Caracas, 17¾c. to 18¼c.; Grenada, 17c. to 18c.; Trinidad, 18¼c. to 18¾c.; Jamaica, 15¼c. to 15¾c.
Coco-nuts—Jamaica and Trinidad selects, $30·00 to $32·00; culls, $19·00 to $21·00.
Coffee—Jamaica, 7½c. to 11½c. per ℔.
Ginger—13½c. to 16c. per ℔.
Goat Skins—Jamaica, 44c.; Antigua and Barbados, 42c. to 44c.; St. Thomas and St. Kitts, 39c. to 41c. per ℔.
Grape Fruit—Jamaica, $2·75 to $3·50.
Limes—$5·50 to $6·50.
Mace—36c. to 48c. per ℔.
Nutmegs—11c. to 11½c.
Oranges—Jamaica, $2·50 to $3·25.
Pimento—3½c. per ℔.
Sugar—Centrifugals, 96°, 4·01c. to 4·14c.; Muscovados, 89°, 3·36c. to 3·49c.; Molasses, 89°, 3·23c. to 3·36c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., October 18, 1915.

Cacao—Venezuelan, $18·00 to $18·50; Trinidad, $18·75 to $19·25.
Coco-nut Oil—81c. per Imperial gallon.
Coffee—Venezuelan, 10c. to 12c. per ℔.
Copra—$4·25 to per 100 lb.
Dhal—$6·50
Onions—$3·00 to $3·50 per 100 lb.
Peas, Split—$9·00 per bag.
Potatoes—English $1·25 to $1·50 per 100 ℔.
Rice—Yellow, $5·80 to $6·25; White, $6·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 18, 1915; T. S. Garraway & Co., October 19, 1915.

Arrowroot—$4·50 to $4·60 per 100 ℔.
Cacao—$15·00 to $16·00 per 100 ℔.
Coco-nuts—$20·00 husked nuts.
Hay—$1·70 to $1·90 per 100 ℔.
Manures—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $85·00 to $90·00 per ton.
Molasses—No quotations.
Onions—$5·00 to $6·00 per 190 lb.
Peas, Split—$10·00 to $12·50 per 210 ℔.; Canada, $5·40 per 120 ℔.
Potatoes—Nova Scotia, $2·75 to $3·25 per 160 lb.
Rice—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $3·80 to $4·25.

British Guiana.—Messrs. Wieting & Richter, October 16, 1915; Messrs. Sandbach, Parker & Co., October 15, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$9·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	15c. per ℔.	21c. per ℔.
Cassava—	$1·20	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per ℔.
Jamaica and Rio	14c. to 15c. per ℔.	14c.
Liberian	——	10c. per ℔.
Dhal—	$6·00	$6·50
Green Dhal	——	——
Eddoes—	$1·20	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	6c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 ℔.)
Marseilles	——	——
Plantains—	24c. to 40c.	——
Potatoes—Nova Scotia	$4·00 to $4·50	$4·00 to $4·50
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·44	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
Tannias—	$3·36	——
Yams—White	$3·00	——
Buck	$3·12	——
Sugar—Dark crystals	$3·65 to $3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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Forest Soils and Nitrogen.

THE usual practice is to classify soils crudely according to their chemical and physical composition, but we can often get a better idea of their constitution and requirements by considering them in relation to the kind of crops they bear. In the tropics this is particularly so where a wide range of soils occurs between the two extremes of desert and dense forest. Speaking generally, it is not the soil particles so much as the heat and the rainfall as well as the aspect, including physical conformations, that determine the most important features of a soil's fertility, because these factors decide what plants can grow there. If the rainfall is heavy, the natural covering will be forest, and as a result of vegetable decay the underlying soil will be rich in humus, and will exhibit certain well-marked bacterial characteristics. This soil is the natural medium of growth for such trees as cacao and rubber, and becomes ultimately what we have come to call an orchard soil. On the other hand, soils which are more exposed to wind and sun, and which receive a lighter rainfall, are inhabited naturally by a hardier type of vegetation, and these are the soils which are ultimately brought under the plough. Such soils as these frequently exhibit greater alkalinity and greater extremes of texture between 'heaviness' and 'lightness', and in the matter of colour, than orchard soils, while the bacterial activity is also different in many respects.

It is our present object to consider what takes place in an orchard soil that makes it different from an arable soil, especially in respect of nitrogen supply.

The form in which cacao and other orchard crops obtain their nitrogen from the soil has been the subject of speculation for some time. Knowing that the supplies of free mineral bases, such as lime, are deficient in such soils, it has been suggested[1] that ammonia formed in the process of ammonification may function as a base for the neutralization of nitric acid formed during the later stages of nitrification. It is well to bear in mind, however, that nitrification may not be active in all orchard soils: and that, moreover, nitrifying organisms will not tolerate free ammonia.[2] Where nitric acid is absent it may be supposed that the ammonia would combine with other acid radicles like carbon dioxide or some of the organic acids, the

nitrogen in this way finding an entrance into the roots of plants in a less concentrated form than ammonium nitrate.

In an examination of cacao soils in Dominica it was found[3] that at the end of several years' trials, the amount of nitrogen was greater than at the outset, and this is attributed to nitrification. A bacterial test of the different soils clearly demonstrated the existence of nitrogen-fixing organisms, and it has been concluded that under the conditions of the plot experiments referred to, considerable accretions of nitrogen may occur as the result of the action of free nitrogen-fixing bacteria of the Azotobacter type, and that the amount of nitrogen fixed may be very greatly increased in the presence of an ample supply of organic matter.

These conclusions are very important because nitrogen fixation is not supposed to play an active part in such soils, at any rate under temperate conditions. An interesting note[4] has appeared on nitrogen fixation in Danish forest soils. *Azotobacter chroococcum* is only occasionally present in these soils, but in some localities where there is much calcium carbonate, two other species of Azotobacter were found present. The causes of the absence of the principal species from forest soils were thought to be due to lack of calcium carbonate, to too low a temperature, and to an excess of humic matter.

That temperature is an important factor has been shown recently in India[5], and it may explain the apparent divergence between the cases of Azotobacter and the orchard and forest soils of Dominica and Denmark. In general, 30°C. was found to be the optimum temperature for maximum activity in India, and it would appear therefore that warmth is an important factor.

In the Dominica investigations the temperature of the plots was studied, and the observations never showed a reading higher than 25°C.

It has to be remembered that though they have many features in common, the conditions of an orchard soil and a forest soil are not absolutely parallel. So far no bacterial examination of true forest soils has been made in the West Indies, and we do not know whether Azotobacter occurs in them or not. If these nitrogen-fixing organisms are absent, it would be interesting to know how the supply of nitrogen is maintained. The suggestion arises as to whether mycorhiza may not play an important part. The fungi of mycorhiza live either on or in the roots of plants growing in humus soils, and are very widely distributed. The relation between the fungus and root is generally symbiotic, that is to say, useful to both organisms, at least in the case of those which live within the root[6], the fungus assisting in the collection of nitrogen and in the elaboration of albuminoid substances in return for carbohydrates manufactured by the green plant. There are instances where the union occurs between a fungus and a non-chlorophyllous plant, as in the case of Neottia. Here we apparently have an example of a higher plant parasitic on a fungus, and it is difficult to see what advantage is derived by the fungus. In general it is more than likely that fungi of mycorhiza are of greatest value to the higher plants on account of their capacity for *manufacturing* higher nitrogenous compounds from soluble humus which they absorb from the soil[7]. It should be pointed out, as an interesting morphological feature of the roots of trees bearing the external fungi, that root hairs are entirely absent, a circumstance which shows that the fungus functions as an organ of absorption.

The extent to which mycorhiza plays an active part in the nutrition of tropical forest plants is not definitely known, and it would be interesting if this question were given specific attention in the West Indies. Further, it may be the subject of enquiry whether many of our economic plants like rubber and cacao can, under certain soil conditions, make use of mycorhiza, especially where the soil is typically acid.

It would appear desirable for the planter to realize that the presence of lime, the importance of which in the soil has been so strongly emphasized, does not seem always necessary for orchard or forest fertility. Acidity does not appear injurious, and may even be beneficial, as is thought to be the case with rubber in the Federated Malay States[8]. Of course with arable soils, effects other than neutralization have to be considered. Here lime is important because of its physical as well as its chemical properties, rendering the soil

[1] Watts, *West Indian Bulletin*, Vol. XIV, No. 2, p. 105.
[2] Russell, E. J., *Soil Conditions and Plant Growth.*
[3] Tempany, *West Indian Bulletin*, Vol. XIV, No. 2, p. 88.
[4] Reproduced in the *Tropical Agriculturist*, Vol. XLV, No. 2.
[5] Walton, J. H., *Memoirs of the Department of Agriculture in India* (Bacteriological Series) Vol. I, No. 4.
[6] Schimper's *Plant Geography*, p. 109.
[7] *Jost's Plant Physiology*, p. 241.
[8] Barrowcliff, M., *Agricultural Bulletin, F.M.S.*, Vol. III, No. 2.
[9] Panganiban, E. A., The *Philippine Agriculturist and Forester*, Vol. IV, No. 4. (July 1915.)

more amenable to cultivation. In the case of tropical soils we know that the addition of lime both increases nitrification and nitrogen fixation. Recently in the Philippines it has been demonstrated that the former process is increased by more than half by the application of 6 tons of lime to the acre[9], while all observers have called attention to the importance of lime in the latter process. The fact remains that orchard and forest plants, and even arable plants, can, in some circumstances, thrive in the absence of lime, and it would be interesting to know exactly to what extent bacteria are responsible for their supply of nitrogen.

SUGAR INDUSTRY.

THE 1914 JAVA SUGAR CROP.

In the *International Sugar Journal* for October 1915, there is published an article by H. C. Prinsen Geerligs, Ph. D., on the Java sugar crop for 1914. From the figures given in this it appears that notwithstanding the increased area planted with cane, the sugar production of Java has been again smaller than in the previous year, a fact that is shown clearly by the quantity of sugar obtained per acre, which in the year under review amounted to 8,676 lb. per acre. The percentage of sugar extracted on 100 parts of cane was also lower than it has been in any previous year, being only 9·28 per cent.

In addition to the exceptional length of the dry monsoon in recent years, Mr. Geerligs assigns other reasons for this low production of sugar. In the first place, the canes planted now do not, he says, stand the drought as well as did the formerly universally grown cane, the Black Cheribon. This was the variety grown since 1850, which has given the most splendid return, and has greatly contributed to the success of the Java cane sugar industry. It could grow and give good returns in any part of the island. It was a success on heavy and light soil, could stand drought and moisture with the same ease, ripened within a year's time, and did not get rotten if it was left standing over. This excellent cane was attacked by the 'sereh' disease, and had to be abandoned after years of strenuous efforts to save it. Its place was taken by several varieties grown from seedlings in special nurseries. Millions of seedlings had to be raised and tested in order to find only a few which were better than the Cheribon cane, and fortunately, two varieties were secured which in their combination not only replaced the old Cheribon cane, but gave results which greatly surpassed the former ones. This advantageous position continued for some ten or fifteen years, but during the last few seasons complaints have been heard, every time with more emphasis, that the new varieties were degenerating: they dry up more rapidly than in former years, and die prematurely, at a time when the sugar content is not yet fully developed. In view of the symptoms of the canes stricken by this phenomenon—that is to say, drying up after the setting in of the dry monsoon—many planters blame the lack of rain for its occurrence. Mr. Geerligs thinks it would be a good thing if new varieties were in reserve to replace the two kinds of canes being at present almost exclusively planted in Java, in case these in their turn are attacked by some disease or other.

In the year 1914 Java was not visited by cane diseases nor did insect pests do more harm than in ordinary years, but in many places much trouble was experienced from an invasion of rats.

In regard to the milling work which has attracted much attention recently, it is mentioned that the loss of sugar in the bagasse is still about 7 per cent. of the total sugar in the cane, and it is considered worth while to try and reduce that loss. With this object in view, at the instigation of the director of the technical section of the experiment station, the bagasse from every one of the mills of a train and all the juices from the different mills were analysed, while the maceration water and the juices used for maceration were measured too, thus giving a good insight into the work done by every one of the elements. It was found that sometimes one or other of the mills do not do as much as they could have done, thereby spoiling the general extraction. The moment such a fault was detected steps were taken to remedy it, and this careful control of the extraction had at once the effect that faults were detected and remedied, which without that investigation would have remained undiscovered, to the detriment of the sugar extraction.

The production of solidified molasses is increasing every year. The total production in 1914 amounted to 96,281 tons, while in 1913 the quantity, then the biggest on record, was only 66,809 tons. The exhausted molasses is boiled in a vacuum pan till all the water has been evaporated, but the mass is still liquid. It is then run into baskets lined with palm mats, where it solidates to a hard block. This molasses is chiefly shipped to Calcutta, whence it is transported to Indian distilleries to be transformed into alcohol.

Taken as a whole, the year 1914 is said not to have been a profitable one for the Java sugar industry, notwithstanding the great care bestowed on every item of the agriculture, manufacture, and the management.

MANURIAL EXPERIMENTS IN BOXES.

A writer in the New Zealand *Journal of Agriculture* (Vol. XI, No. 2) calls attention to a useful method of making manurial experiments by means of growing the plants in wooden boxes. The chief advantage of this method would appear to be the greater area of soil that boxes allow in comparison with pots, the results accordingly possessing some considerable application to field conditions. In closing his description of the method the writer concludes:—

'Carefully carried out by intelligent observers, the box method of testing the manurial requirements of soils, and of the various crops grown upon them, should prove of considerable value. While it supplies the farmer with a means of determining the mixture likely to give him the best results, and thus ensures him against wasting money on unsuitable fertilizers, it also offers to school-teachers an excellent method of demonstrating the science of manuring. If capable school-teachers with some knowledge of the subject were to adopt this means of instruction, they could not only readily demonstrate to the students, in a practical manner, at a very small cost in time and money, the respective values of different fertilizers to the soil, but eventually, through the number of soils they would be able to handle in the course of a few years' instruction work, the schools might become a sort of bureau of information as regards the different soils in their various neighbourhoods. In a country so varied in its soil requirements as New Zealand, this would largely assist the farmers in their efforts to increase the production of the land, and indirectly the revenue of the Dominion.'

LIME CULTIVATION.

NEW PLOT EXPERIMENTS IN DOMINICA.

The first series of manurial experiments with lime cultivation, writes Mr. Joseph Jones in his annual report, was laid out in the valley beyond Morne Bruce in the early months of the year 1913. The experiments, which may now be divided into two series, are probably the first of their kind to be carried out with limes, and may therefore be regarded as being of great general interest. As already stated, there are now two series—

SERIES 1—with old lime trees which existed on the plots when the experiment was laid out;

SERIES 2—with young lime trees only planted in July 1913.

The condition of the lime trees constituting series 1 when the experiment was commenced in January 1913, may be gathered from the following description taken from previous reports and reproduced here for ease of reference:—

'The limes in question were planted during 1893 by the boys of the Reformatory School, a Government institution which existed at Morne Bruce from January 1893 to December 1895. To the end of the latter year the plants were cared for, but from that time to the present the land has remained in bush amongst which the limes have struggled to exist. On the bush being removed, the lime plants were found, as expected, to be poor in condition and attenuated in appearance. With attention these poor limes should develop into healthy well-shaped trees in the course of time.

'It is to be expected, under the condition stated above, that the plots are not complete. Vacancies occur in each, which will be filled in as soon as possible.

'The land occupied by the plots is sloping in character, conditions typical of large areas of lime cultivation in the island.'

These trees continue to make satisfactory progress in developing new wood, and are gradually assuming a normal appearance, though it will take some years before this is completely achieved.

The area of existing lime trees was sufficient to allow of eight plots of approximately $\frac{1}{4}$-acre to be started.

Each plot received its first annual quotum of manure in July 1913. In May 1914, a second similar application was given, and it is intended to make identical applications in May-June of each year. The limes from each plot have been collected and measured throughout the crop season, necessitating thirty-five pickings.

The figures obtained indicate the progress the trees have made in twelve months. All the plots without exception show a very considerable increase, ranging between 203 per cent. to 466 per cent. The control plot (B) shows an increase in yield of 230 per cent. This may be regarded as the increase due to natural causes—the mere clearing of the surrounding bush and the cutlassing which this plot, in common with all the others, has received; and it is fair to assume that most of the other plots would have recovered to the same extent, and in some cases even more, apart from the effect of any manurial treatment received.

It is much too early to come to any conclusion on the figures which are now available, as to the most suitable manure or combination of manures for lime trees; but even at this stage it is justifiable to point out the considerable increase which has followed the use of organic nitrogen in the form of dried blood, whether it is used alone (plot D), or in conjunction with phosphate and potash (plot A), or even with phosphate alone (plot H). In all three cases the addition of the manure has resulted in a substantial increase of yield over the no-manure plot.

Apart from yields, and judging only by the appearance of the trees, the outstanding feature is the excellent growth made by the complete manure plot, and also the steady, if slow, improvement in the condition of the mulched plot; and it should be remembered that this latter plot was, with perhaps one exception (plot F), the most backward of all when the experiment was first laid out.

SERIES 2—with young limes.

The series consists of eight $\frac{1}{4}$-acre plots on fairly level land adjoining the older trees. They were planted in July 1913 and have, on the whole, made satisfactory growth. It is the intention to duplicate with the young cultivation the experiments carried on with the older trees, thus confirming or otherwise the results obtained.

ADDITIONAL EXPERIMENTS WITH LIME CULTIVATION.

Two additional manurial plots of old lime trees were laid out a year after the original series; to one of these, cotton seed meal at the rate of 10 cwt. per acre was applied, and to the other, a dressing of lime at the rate of 5 cwt. per acre, and a mulch of grass at the rate of $2\frac{1}{2}$ tons per acre. Similar applications are to be made annually, and the yields recorded.

In one of these plots charges of dynamite were exploded in fifty-six holes between the trees; but after a long wait no improvement could be observed in the condition of the trees.

Trees in a similar condition on another portion of the field were treated in the same way with dynamite, but after twelve months' time no improvement is observable. Judging from these and other experiments carried out by planters, no good effects con be discerned from the explosion of dynamite in lime cultivation. There may however be certain conditions such as the close proximity of a hard-pan to the surface, under which the use of explosives may be advantageous.

Within the area enclosed by a fence early in 1914 there was sufficient unoccupied land to lay out six additional $\frac{1}{4}$-acre plots. Three of these were planted in seedling limes, and these have made a good start. The remaining three have been disposed of as follows: A and B in ordinary limes budded on sour orange stocks, and C in spineless limes budded on the same stocks. These three plots are likely to prove of the greatest interest and value in demonstrating certain important points in lime cultivation, which are likely to develop in the near future.

Advantage was taken while planting these additional plots of testing the efficiency of holes made by dynamiting as compared with holes made in the usual way with the spade; each alternate row of holes in the budded lime plots was dynamited in December, and the remaining rows were made soon after with the spade.

The holes were carefully filled in a few days before planting to allow time for sinking, and early in July the planting was done. At the time of writing (April) there does not appear to be much difference one way or the other, but the plots are still under observation in this respect.

Another piece of land having lime trees growing rather irregularly was cleared up in December 1914, and may at some later date be available for experiment purposes; it measures about $\frac{1}{3}$-acre.

THE TRANSFUSION OF SAP.

A writer in the *Gardener's Chronicle* for September 11, 1915, introduces what appears to be a new idea in fruit growing, namely, the practical application of the principle of transfusion of sap. He says:

When raising new fruits by crossing two varieties, a sufficient stock of seedling trees should be produced and 'grown on,' so that only a self-pollinating tree might be used to propagate a stock for cultivation. If a sufficient number of seedling trees (of any one cross) were tested it is certain that some would carry the character of producing fertile pollen, and yet be in other respects the same as a sterile variety of this cross. The process I have indicated would entail but little trouble at the outset, and would be the means of preventing a vast amount of trouble and loss. These self-sterile varieties of fruit trees have to depend upon a 'fair wind' for the carriage of pollen from another variety forming a suitable mate. The question now is whether we can even now correct the fault of sterility in these trees and make them capable of pollinating their own blossoms. I think we can. My suggestion is that the character of producing fertile pollen may be introduced into sterile varieties of fruit trees by transfusion of sap, by the simple expedient of a graft from another variety. In confirmation of my theory I will mention a case which has come under my notice. A large plantation of one variety of fruit trees failed to fruit, and it was found that when artificially pollinated with pollen of another variety. branches of these trees fruited perfectly. It was therefore decided to try the experiment of introducing a graft of this variety on the top of each tree, for the purpose of ensuring the presence of fertile pollen on each plant. The operation was carried out last March, and the result proved successful, but not in the way expected. The trees fruited at once, and so heavily that the fruits had to be thinned. This was not, then, the result of the pollen from the grafts, because these did not flower. Was it, then, the transfusion of sap from these grafts? I think that it was, and I submit that the matter is at least worth a trial. I would invite fruit-growers to make experiments such as I have indicated.

COLOUR AND POISON IN THE LIMA BEAN.

It is stated in the *Tropical Agriculturist* for August 1915, that Bulletin No. 12 of 1914, issued by the Department of Agriculture, Burma, deals exhaustively with the economic value of Burma beans and peas.

The authors (Messrs. Thompstone and Sawyer) express the hope that as a result of their having clearly defined the various kinds of peas and beans, the confusion caused by making such a minor quality as colour the basis of commercial classification (e. g. white beans) will be cleared up, and that the bulletin will serve its object as a botanical and agricultural guide to this class of plants.

The note on the poisonous properties of the so-called 'Rangoon bean' (*Phaseolus lunatus*) is of interest from a local point of view, in view of the fact that species of this bean are commonly cultivated in the island, and that their cultivation is extending as the result of the distribution of seed by the Agricultural Society.

According to the authors, there is considerable variation in the percentage of the poisonous principle of the beans, but the conditions most favourable to its developments have yet to be investigated. It would appear that the variety of a light brown to red or purple, plain or mottled, is the chief, if not the only type which contains the prussic acid-forming glucosides to any dangerous extent.

The white types are recommended for cultivation by the Director of the Imperial Institute as being less dangerous for consumption, and it is suggested that the amount of prussic acid contained in the beans may depend to some extent on the method of cultivation and the degree of maturity of the bean at harvest.

The Burmans consider the dried haulms a safe cattle feed, but when fed fresh, and particularly when in flower, they look upon it as a dangerous food which causes death within twelve hours.

In Burma the beans are eaten boiled or parched, which is probably the reason why they are innocuous.

No fatal results are known to follow the consumption of the beans in Ceylon, probably for the same reason, viz.: that they are well cooked (boiled or curried) before use.

The subject of the poisonous nature of Lima beans is dealt with in the *West Indian Bulletin*, Vol. XV, No. 1.

PLANT BREEDING IN MARYLAND.

Plant breeding at the Maryland Agricultural Experiment Station is on a large scale, both as regards practical problems, and the theoretical problems which it is attempting to solve. Mendelism is being investigated in cowpeas, in connexion with selection; wheat, oats and barley are being cross-bred and selected; corn is being bred and studied in a series of experiments which has now been under way for ten years; mutations are being systematically sought in the cereals. A new variety of pear of good quality and resistant to blight is sought by crossing, particularly Kieffer by Seckel; apples are being bred in a similar way, to produce a good, early red apple of good cooking quality. Grape hybrids include most of the hardy American species as well as the Malaga type of Southern Europe, *Vitis vinifera*. Strawberries, celery, tomatoes, musk melons, Irish potatoes, cabbage, are also the subjects of projects destined to furnish more productive or disease-resistant varieties, and also to yield information about the laws of heredity. Finally the station is doing genetic research with one kind of material which has been very little worked, namely, the castor bean (*Ricinus communis*), where the variation and heredity of individuals propagated from different branches and different flowers are being investigated. The production of ornamental plants, a work usually left to commercial nurserymen, has been undertaken to the extent of breeding improved strains of dahlia and Black Eyed Susan. (*Journal of Heredity* for September 1915.)

Improving the Chile Pepper.—The chile pepper (*Capsicum anuum*), so much relished by Mexicans, is the object of attention at the New Mexican Agricultural Experiment Station, where for the last five years it has been improved by selection for larger, smoother, fleshier pods, and freedom from blight. Three good strains have been perpetuated from the fifteen with which the experiment started. (The *Journal of Heredity* for September 1915.)

COTTON.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date October 18, with reference to the sales of West Indian Sea Island cotton:—

Since our last report about 400 bales of West Indian Sea Island cotton have been sold at firm prices; these include Nevis 14*d.* to 14½*d.*, St. Kitts 15*d.* to 16*d.*, Virgin Islands 14*d.*, St. Martin 14*d.*, Montserrat 14*d.* to 15*d.*, Anguilla (New crop) 14¾*d.*, Antigua 14*d.* to 15*d.*, and Stains 7*d.* to 9*d.*

Spinners are not purchasing for immediate requirements, but for stock. The supply here is now very much reduced.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending October 30, is as follows:—

Islands.—The sales are reported as 135 bales, but they were chiefly made at the close of last week. The market has been quiet this week, with only a moderate demand for Fully Fine. There has been no inquiry as yet for the other grades, nor for the planters' crop lots. With the receipts to date of only 600 bales, there is no accumulation of stock, and factors are not pressing their moderate offerings for sale, and are refusing to sell under:

Extra Fine	29c. = 18½*d.*,	c.i.f.	&	5	per cent.
Fully Fine	27c. = 17½*d.*,	,,	,,	,,	,,
Fine	26c. = 17*d.*,	,,	,,	,,	,,

Floridas and Georgias.—The market has ruled very steady throughout the week, with sufficient demand to take all the offerings of all grades, which were put on the Savannah market for sale, the buying being on account of the Northern Mills. Towards the close of the week there was a quieter feeling, the demand being principally for Choice and Extra Choice. Throughout the interior there was more disposition to sell, and some sales were made of round lots, including all grades at a concession of about ½c.

However, the general buying has been at our quotations, and it is still difficult to secure even running lots of good quality. Any lower quotations are based on the expectation of a lower market. We quote, viz.:

Fancy	25½c. to 26c.	= 26¾c. to 27¼c.	landed.
Extra Choice	25c.	= 26¼c.	,,
Choice	24c.	= 25¼c.	,,

The exports from Savannah for the week were, to Northern Mills 1,166 bales, Southern 100 bales, and from Jacksonville to Northern Mills 805 bales.

The United States Census Bureau reports cotton ginned to October 18, as follows:—

South Carolina	669 bales		
Georgia	26,757 ,,	making a total of	40,257 bales.
Florida	12,831 ,,		

Against last year	30,078	bales,	total crop	78,857	bales.
,, 1913	30,880	,,	,,	,,	85,544	,,
,, 1912	15,960	,,	,,	,,	66,169	,,
,, 1911	40,303	,,	,,	,,	122,512	,,

THE PRACTICAL VALUE OF SOIL ANALYSIS.

Inquiries are frequently received, it is said, in a leaflet issued by the English Board of Agriculture, from farmers and gardeners who wish to be informed where they can have soils analysed. In most cases the idea appears to be entertained that having a soil analysed is a ready means of determining its manurial requirements or of obtaining an indication of its fertility. A brief discussion as to how far this view is correct may therefore serve a useful purpose.

A complete soil analysis includes chemical, physical and bacteriological investigations, and may be accompanied by general field observations for the purpose of ascertaining the nature of the subsoil, the water-supply, and climatic and other conditions important for the growth of plants. A full investigation of this kind, however, is very laborious, and in practice the analysis is usually less comprehensive, and aims not so much at giving a complete account of the soil as at determining the amounts of certain substances present in the soil, which are known to have an important effect on crop production.

Experience has shown that a soil analysis is of little practical value when the interpretation is based on the results obtained from an isolated sample of soil from a district of which the analyst has no intimate knowledge. In certain special cases, e.g., where it is required to determine whether a soil is in need of liming, an analysis may be of great assistance to the farmer, but even where the investigation is a comprehensive one, the analyst can only give a very incomplete idea of the general fertility of a particular field. It is difficult to place an absolute value on the results, and the element of uncertainty enters too largely into the interpretation. The difficulty will be appreciated if an attempt is made to obtain information as to the best system of manuring.

The analyst can determine as accurately as need be the percentages of nitrogen, phosphates and potash in the soil, but it has been found that, even where external factors such as climate, depth of soil, etc., do not enter into the case, there is often little or no connexion between these percentages and the soil's fertility or its manurial requirements. Any ordinary soil contains much more total plant food of all forms than a single crop of any kind can possibly require. Most of this plant food, however, is in a condition in which the plant cannot make immediate use of it, and is only gradually made available, the rate varying in different cases. As the plant can only make use of the free or available food, it is clear that it is possible for one soil containing quite small amounts of the manurial substances to produce better crops than another soil containing large quantities, if for any reason the first soil gives up its material to the plant at a more rapid rate than the second. In fact, some soils contain large quantities of nitrogen and still respond most readily to small dressings of manure containing available nitrogen, because practically all that is already in the soil is unavailable and, as far as the plant is concerned, might almost as well not be there at all. This also holds equally for phosphatic compounds; a soil may contain a good deal of phosphate and yet respond to more.

It is true that in the case of phosphates and potash a method has been devised of roughly measuring the amount which may be regarded as of immediate or prospective value to the plant, by ascertaining the quantity which is dissolved out in a given time by a weak solution of citric acid. This method gives results which in many cases indicate fairly well whether a particular soil will respond to an application of either of the two kinds of manure, and may be used in comparing soils of the same class. At the same time there are many cases where the results obtained are at variance with those obtained

by actual experiment in the field, and so far no ready method has been discovered by which the availability of the nitrogen in the soil can be estimated, except as regards the small amount present in the form of nitrates or of ammonium salts. It will be seen, therefore, that chemical analysis of an isolated sample of soil can hardly be expected to supply a very accurate and reliable means of determining its manurial requirements, and it is probable that a simple field experiment would yield better results.

It is not only a question of what the soil contains but also of what the plant needs. A plant is a living thing, and its needs are not constant but vary with the conditions under which it is grown. Thus a plant *needs* more phosphates on a clay soil than it would on a sandy soil, and it *needs* more potash on a sandy or peat soil than on a loam. Again a plant growing in a district receiving 32 or more inches of rain is in greater need of phosphates than in districts with less than 24 inches of rain.

Further, under present conditions, an isolated mechanical analysis cannot be considered of much value to the farmer. By means of a mechanical analysis it is possible to measure the proportions of particles of different degrees of coarseness in the soil, and so determine to some extent the ability of the soil to meet the plant's requirements as regards the supply of water and the proper aeration of the soil.. At present, however, it is probable that an experienced farmer would be able to gain more useful and accurate information by examining the land carefully at different times of the year.

DIRECTIONS IN WHICH A SOIL ANALYSIS MAY BE USEFUL.

While isolated soil analyses are of little practical value at present, there are one or two directions in which an analysis can afford useful assistance.

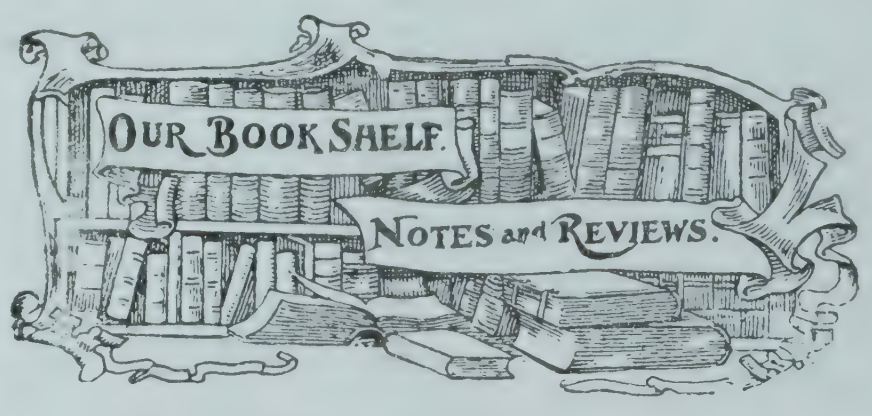
1. A farmer may wish to know whether he has any reasonable chance of obtaining results similar to those demonstrated by field experiments on another farm in the locality. Where such experiments have shown the advantage of applying lime, phosphates or potash, the analyst can determine whether similar results are likely to be obtained on the soil which he analyses. The element of uncertainty will always be present, but there is every prospect that the advice will prove to be correct. In this way the farmer may be saved much time and expense in carrying out the experiment for himself.

2. A soil analysis may also prove of assistance where a farmer proposes to introduce a system of cropping or tillage known to give good results elsewhere in the locality, but before doing so wishes to compare his soil with that on which the system is successful. Analysis may reveal differences which although not obvious to casual inspection are of vital importance to the success of the enterprise. Two heavy soils, for instance, may look very similar, but one may owe its heaviness to very fine particles, and the other to silt particles, and methods successful in one case may prove failures in the other.

3. A farmer entering a new farm may wish to obtain complete information as to the possibilities of the soil, with a view to taking up some special branch of production, or ascertaining for what special crops the soil is suited. A soil analysis will show whether the soil and general conditions resemble those obtaining where the proposed system of farming is known to be a success. Where important differences are revealed the farmer may be able, with the assistance of the agricultural expert, to modify the scheme so as to adapt it to the possibilities of his soil.

It will be gathered from the above notes that the maximum assistance can only be obtained from a soil analysis when data are available for comparison with soils of the same type. Fortunately the country is now provided with organized schemes under which systematic investigations may be made and the results recorded. Soil surveys supplying fairly full information with regard to special classes of soil in a limited area, and carefully conducted field experiments, are being carried out in many parts of the country. As time goes on, therefore, the possibility of setting up comparisons will steadily increase and analyses will be of correspondingly greater value.

Before deciding to have a soil analysis carried out, the farmer should apply to the Country Agricultural Organiser, who will advise him whether material for a comparison is available, and whether the analysis would be likely to give useful results.



RUBBER MACHINERY. By Henry C. Pearson New York. The *India Rubber World*, 1915. Pp. 413, figs. 428. Price $6.

Mr. Henry C. Pearson, editor of the *India Rubber World*, may be congratulated on the successful completion of so arduous a task as that represented by the present volume, which amounts to nothing less than a standard encyclopedia of machines used in rubber manufacture. Every phase of the industry would appear to have received attention—crude rubber washing, drying, preparing of ingredients, mixing, preparing of fabrics, calendering, vulcanizing; calenders, drives and safety stops; presses and moulds; spreaders and tubing machines; machines used in the manufacture of reclaimed rubber and cements; temperature regulating devices; extracting machines for wild rubber, for deresination; laboratory equipment, testing machines and devices;—these are the principal matters dealt with.

While the body of the book lies outside the range of tropical agriculture, we may infer its general excellence from the last mentioned section devoted to rubber laboratory equipment, much of which we are in a position to appreciate. Many of the devices shown contain features of special interest and ingenuity, and might be usefully imitated in other branches of agricultural and industrial chemistry.

Chapter II on crude rubber drying, and Chapter XIX on temperature recording and controlling devices are interesting to us from the circumstance that these matters, and consequently the machinery pretaining to them, are important in many different branches of tropical agriculture.

The book will no doubt be found an important addition to the library of all those involved in the production or manufacture of rubber, especially for purposes of reference. There is a good index, and the chapters are subdivided into sections. The printing is excellent, and the illustrations are abundant and remarkably clear in every detail.

EDITORIAL NOTICES.

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The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number discusses the manner in which trees growing in orchard and forest soils obtain their supply of nitrogen. The question of the possible importance of fungi in this respect is raised.

Important experimental work with limes in Dominica receives attention on page 272.

Items of Local Interest will be found on the last page but one in this issue.

Insect Notes, on page 378, concern the control of ants which take away onion seed: and Fungus Notes, on page 382, throw new light on the witch-broom disease of cacao.

Competition in the Orange Trade.

According to an article in the *Journal of the Royal Society of Arts*, it appears that orange interests in Spain were much perturbed on the outbreak of war, and mass meetings were held to urge the finding of new markets in America. With this object a delegation of orange men went to the United States to investigate that market, and to see if it were possible to inaugurate direct trade with that country: but it was soon discovered that competition with California and Florida fruit was not feasible.

It would seem that if a large and old-established industry like that of orange growing in Spain cannot find an opening in the United States, it must be even a more difficult matter for the West Indian trade to effect such an opening. And we have to remember that it is not merely California and Florida with which competition takes place, but also Cuba, Porto Rico and Central America—in fact all the vast fruit-producing areas controlled by the United Fruit Company.

War Conditions and the Rubber Trade.

It is interesting to read in the *Colonial Report* on the Straits Settlements for 1913 that the inflated dividends of the rubber trade of previous years are 'gone for ever'; and then to turn to such an article as that on Hevea in the *Agricultural Bulletin*, F.M.S., for July 1915, and see that the present condition of the rubber market is in the nature of a small boom in low-priced shares—a result of the present increased demand for the commodity. The war has made heavy demands upon the rubber trade both in England and America. This no doubt was one of the reasons which led to the removal of the embargo on Eastern rubber for the United States last year. Increased production is likely to be maintained for some time.

On the planter's side however, it is worth reflecting on, that the present phase of activity may be followed by one of greater depression than ever, and in this connexion the present tendency towards reduction in estate expenditure is to be strongly encouraged. It was mentioned in the last issue of the *Agricultural News* that on some estates in Ceylon, for example, rubber is being produced by means of alternate day tappings and other economies at an all-in cost of 7*d.* per lb., or even less.

At this cost good profits can be realized if first grade rubber is only selling at 1*s.* per lb. instead of 2*s* 6*d.*, which is nearer the usual price. Further saving may, it is expected, follow ultimately from the selection of seed on the lines recently instituted by Dr. Cramer, and advocated for the Federated Malay States by Mr. Coombs, Economic Botanist, in the *Agricultural Bulletin*, already referred to above.

Reductions in estate expenditure in every kind of cultivation is the best safeguard against economic depression in the markets.

Peanuts and Pigeon Peas for Export.

Attempts are being made to establish a peanut trade with Canada, and the proposal appears to have attracted the attention of growers in Montserrat where a start has already been made. In St. Lucia, Mr. A. J. Brooks notifies planters (in the *Official Gazette*) that a supply of four different varieties of seed is available for planting in that island, and these consist of Gambia, Virginia Running, Virginia Bunch, and Refusque. They are being sold in two-penny packets, and each includes a useful leaflet giving instructions as to how they should be planted.

In St. Vincent much interest has been aroused in regard to the possibilities of exporting Pigeon peas to New York, through a letter received by Mr. W. N. Sands, the Agricultural Superintendent, from Mr. W. A. Domingo, Importer of Tropical Produce, 115, West 135th Street, New York. Mr. Domingo writes:—

'I am reliably informed that Barbados and some of the other islands depend largely on St. Vincent and some of the Grenadines attached to it for their supply of Pigeon peas. As I am interested in the importation of this product, I am asking you to put me in communication with a firm or someone who can supply me with regular quantities at lowest prices. There is a fairly good market here for these peas, but to sell wholesale they must compare favourably with importations from Jamaica, Haiti and Cuba, and be able to compete with other American peas and beans in price.

'So as to avoid unnecessary correspondence, I suggest that you advise prospective shippers to quote me, c.i.f. New York, on 10 barrels via Barbados or the cheapest route. Also, in quoting, send a small sample for inspection. I trust that you will grant my request, and recommend only responsible and reliable parties.'

No opportunity should be lost in the matter of establishing new markets for minor crops, such as referred to in the above communication.

Need for Co-operative Credit Societies in England.

The Report of the Agricultural Organization Society (England), for the year ended March 31, 1915, has recently been issued. This society, it may be observed, has from the time of its formation some fourteen years ago, been devoting itself to the re-organization of the business side of the agricultural industry in England and Wales, and more particularly in regard to the application of the principles of co-operation amongst farmers and all kinds of agricultural producers. Amongst the many matters of importance dealt with in this Report is the subject of Co-operative Credit Societies. It is mentioned that in England co-operative credit is still a very small movement as far as agriculture is concerned. There seems to be little desire on the part of small holders and farmers to avail themselves of any of the methods which so far have been devised for enabling them to co-operate in this direction. Yet there is reason to believe that in many country districts the small cultivators have to resort to the moneylender in one way or another, while it must be generally admitted that there are indeed few agricultural districts where the small cultivators would not be greatly benefited by a more ready access to capital to be utilized for reproductive purposes. But very great difficulty appears to be experienced in England in putting forward any workable scheme which will at the same time meet the requirements of the situation and yet be received favourably by those whom it is designed to help.

In connexion with the foregoing, readers of the *Agricultural News* will recollect the considerable difficulties that had to be encountered in the efforts made years ago to introduce agricultural credit societies in the West Indies under the Raiffeisen system. Those difficulties have however been successfully overcome, and, as reference to this Journal will show, at the present time there are several societies operating, or shortly to start operating, under Ordinances passed in the West Indies, namely in St. Vincent, Trinidad and in St. Lucia; and these will afford agricultural credit facilities to the small cultivators there.

Pine-apples for Canada.

Correspondence is to hand concerning pine-apples that were shipped from Montserrat and St. Kitts to Canada with the object of obtaining information with a view to establishing a trade in that country in this West Indian product. It appears that if success is to be secured, much attention must be paid to the grade of fruit exported. It appears that the quality of the pine-apples sent from Montserrat were superior to any pines that had been received from Porto Rico, Cuba or Florida; but from the fact that the Montserrat pine-apples were so full of juice and will not keep for half the length of time the fruit from Cuba will, it would seem that a satisfactory trade is only possible with an inferior class of pine, which, it is said, should be packed in the same way as the Cuban fruit is. It will therefore probably be found desirable to cultivate the Red Spanish variety. Under these conditions it is probable that any island could dispose in Canada of 300 to 400 crates on each trip of the Royal Mail steamers during the season. The best time to ship would be before Porto Rico and Cuba enter the market, namely about Easter time. It is interesting to record the fact that the question of quality and keeping powers is also diametrically opposed in the case of oranges. This is well illustrated in the case of California and Florida oranges. The Navels have only about 50 per cent. of the juice of the Florida oranges, but will, on the other hand, keep sound quite three times as long.

INSECT NOTES.

THE CONTROL OF ANTS WHICH TAKE AWAY ONION SEED.

St. Vincent onion growers are faced with the difficulty that so soon as seed is planted, it is carried away by ants. If an onion industry is to be established in the Colony, the control of ants must be undertaken, as they may remove the greater part of the seed before it germinates, and may even destroy those seeds which have germinated, by biting holes in the young shoots.

An account has been received of various experiments performed at the Experiment Station in St. Vincent in connexion with the control of these pests. Certain of the experiments have given only negative results; nevertheless, the experiments are instructive and may be described.

Two species of ant seem to be concerned in the trouble. One of these is the ordinary black 'stinging ant' which is so constantly present on cotton plants where it feeds on the sweet juice exuded by the cotton aphis. The other kind is similar in general appearance, but the legs are rather longer.

After the seed-beds have been prepared and before planting, it is recommended that they be 'burnt off'. This can be done by spreading a layer of dry grass, bush or trash over the beds and setting fire to it. A large number of ants and other insects as well as weed seeds will be destroyed by this procedure, and the germination of the seed when sown will be facilitated.

After burning it is advisable to place a few onion seeds on pieces of paper in various parts of the seed-bed, and keep these under observation. If ants are still present they will be seen to take away the seed, and the control of them must be undertaken.

The following experiments have been tried:—

(*a*) *Poisoning the ants with acetylene gas.*—The entrances to the nests were located by tracking the ants. A piece of calcium carbide was pushed as far as possible into the hole, and water poured down. The hole was then plugged with cotton lint. It was thought that the acetylene so generated would penetrate to all parts of the nest and poison the ants. The results did not justify expectations. A large number of ants were undoubtedly killed, but it seems that the habit of these insects is to live in comparatively small colonies with many outlets. This method of control was therefore judged to be impracticable and uncertain.

(*b*) *Treating the seed-bed with Vaporite.*—Vaporite sprinkled over the seed-bed exercised a deterrent effect upon the ants for a short time, but the effect soon wore off.

(*c*) *Treating the seed with a paste made of kerosene and wood-ashes.*—This was unsuccessful. The ants carried away the seed.

(*d*) *Treating the seed with a 1-350 solution of corrosive sublimate.*—This experiment was also unsuccessful.

(*e*) *Attracting the ants to various baits and killing them with hot water.*—Success has been met with along this line of work, and onion growers are strongly recommended to follow out the method of control described below. After some preliminary trials it was discovered that pieces of ripe avocado pear, and small pieces of meat, or of bone with a little meat attached, constituted the best bait, the ants being attracted to them in very large numbers. A number of pieces of avocado pear were placed on the seed-bed at a distance apart of about 18 inches. As soon as a fair number of ants were attracted, the bait and the soil immediately undearth, covered with ants, were immersed in a vessel of hot water. This was repeated, the work going on continuously for a few hours. Next day the ants refused to take any pear, and onion seed scattered in various parts of the seed-bed was quite unmolested. Pieces of meat were put down, and as fast as the ants gathered on these they were destroyed. A large reduction in the number of ants in the vicinity of the seed-bed was thus effected, and the seed germinated without giving much trouble.

It may be pointed out that these ants are likely to be most abundant (a) in newly cleared land, (b) in land which has previously been in corn, cotton or canes. The ants make their nests in fields devoted to these crops in order to feed upon the sweet juice exuded by the cotton aphis, and by the sugar-cane mealy-bug.

In view of the dipping experiments which are soon to take place in Antigua, attention may be called to *Bulletin No. 259* of the United States Department of Agriculture, which deals with studies on oxidation changes in arsenical dipping baths. It appears that arsenites are readily changed into arsenates by the action of bacteria, if the liquid is left exposed and undisturbed too long. This should be avoided as much as possible, because arsenate is not such a powerful tickicide as arsenite. The use of formalin as a preservative is suggested, but in the ordinary way it does not seem that its employment is worth while from a business point of view.

INDIAN POPULATION IN CROWN COLONIES AND PROTECTORATES.

The following return, compiled from the 1911 Census reports, is taken from the *Wealth of India* for July 1915. It is of interest in connexion with West Indian Immigration and the recent report on the same by the Government of India. Adults have been regarded as persons aged sixteen years and upwards. The high proportion of males to females will be noticed as a typical feature of the figures given. It is a feature which is not without considerable social and economic significance:—

British Guiana:—Total Population, 309,041, Indian, 126,517, Adult (Males 53,083, Females 34,779,)—87,862; Ceylon, Total Population, 4,110,367, Indian, 470,651; East Africa Protectorate, Total Population, 4,000,000, Indian 11,886; Fiji Islands, Total Population, 139,541, Indian 50,286, Adults (Males 20,062, Females 8,785,)—28,847; Jamaica, Total Population, 831,383, Indian Population, 17,380, Adults (Males 7,127, Females 4,775,)—11,912.

Windward Islands:—Grenada, Total Population, 66,750, Indian, 406; St. Lucia, Total Population, 49,877, Indian, 2,064; St. Vincent, 41,877, Indian, 376.

Leeward Islands:—Antigua (with Barbuda and Redonda) Total Population, 32,296, Indian, 3; Dominica, Total Population, 33,863, Indian, 8; Montserrat, Total Population, 12,196, Indian, 2; St. Christopher and Nevis, Total Population, 43,403, Indian, 38; Virgin Islands, Total Population, 5,562; Malay States (Federated), Total Population, 1,036,999, Indian, 172,465, Adults (Males 116,626, Females 28,368)—144,994; Mauritius, Total Population 377,083, Indian (a) 257,697, Adults (Males 89,996, Females 71,833)—161,829; Seychelles, Total Population, 22,691, Indian, 420; Straits Settlements, Total Population, 714,069, Indian, 82,055; Trinidad and Tobago, Total Population, 333,552, Indian, 50,585, Adults (Males 31,989, Females 17,159)—49,148; Uganda, Total Population, 2,843,325, Indian, 1,622.

THE TEMPERATURE OF THE SOIL UNDER DIFFERENT CONDITIONS.

In the *Memoirs of the Department of Agriculture in India*, Chemical Series, Vol. IV, No. 2, appears an account by Dr. Leather of important studies in soil temperatures, and a summary of this account is reproduced below. Its importance lies chiefly in the fact that a correlation has been established between the temperature of the air and the soil, so that it now becomes possible in India to *calculate* the soil temperature under specified conditions of soil and climate.

Several series of observations on soil temperature have been made in the West Indies, amongst which may be mentioned those made by Mr. W. R. Dunlop in St. Kitts (see *Agricultural News*, Vol. XI, p. 125, April 27, 1912), and more recently the records of Dr. H. A. Tempany in connexion with the Dominica cacao plots (see *West Indian Bulletin*, Vol. XIV, No. 2, 1914). In the former investigation, apart from interesting synchronical observations in two different parts of the island, the extent of the diurnal range in exposed soil at shallow depths was shown to be very considerable (20° at 3 inches), and markedly influenced by such conditions as cultivation, colour and aspect. At 2 feet the temperature was found to be practically constant, though even here the cooling effect of rainfall, referred to both by Dr. Tempany and Dr. Leather, was found to be observable. In the Dominica observations, the chief point brought out was the equable nature of the soil temperature under cacao trees, both from month to month and at different depths. The range was only about 2° in the course of many months, including the cool and hot periods, while between depths of 6 inches and 18 inches there was only a difference of a fraction of a degree. The temperature of the soil of a cacao plantation under Dominica conditions is about 23°C. at 6 inches, while in an ordinary exposed soil it may be regarded as being, for purposes of comparison, about 30° during the hotter hours of the day.

In India, as elsewhere, the temperature of the surface soil naturally varies, both with the hour of the day and with the season.

Dr. Leather states that, as regards the seasonal variation, the minima are in January and the maxima in May.

In bare-fallow soil the diurnal change of temperature extends to between 12 inches and 24 from the surface on most days in the year. At 12 inches it amounts to about 1° C., but at 24 inches it is doubtful whether it ever exceeds 0·1° C. in Bihar, and probably does not exceed 0·2° C. in any part of India.

'There is a fairly close correspondence between the temperature of bare-fallow soil at 1 inch from the surface and that of the air in the shade; approximately the soil minimum at this depth is about 2·0° C. higher than the air minimum, and the soil maximum is about 3·0°C. higher than the air maximum.

'There is also a similarly close relation between the diurnal change of temperature in the soil (bare-fallow) at 1 inch from the surface and in the air (shade), the diurnal change being about 1·5° C. greater in the soil at this depth than in the air. This diurnal change is least during the monsoon and greatest during the dry season; at the former season (June to September) it is about 10° C. in the soil (bare-fallow) at 1 inch deep, and during the latter (in March and April) it frequently approaches 20°C.

'The temperature of the soil near the surface (down to 3 inches or 4 inches) is above the mean temperature for only about eight hours daily, whilst it is below it for about sixteen hours.

'The lag in temperature is about two hours at 3 inches deep and about eight hours at 18 inches from the surface.

'A change in the specific heat of the soil, due to change of moisture content, does not seem to effect the maxima or minima; but rainfalls during the dry season, causing a considerable change in the amount of water evaporating, have a marked effect.

'It is possible to estimate approximately the temperature to which the soil rises under specified conditions in other parts of India.

'The effect of a covering crop on the soil-temperature is naturally very marked, for it both prevents the surface soil from rising to the temperature which fallow land assumes, and also modifies the diurnal change. Thus whilst the temperature of exposed soil at 1 inch deep rises to about 3° C. above that of the air, that of cropped land is about 2° C. below it; and whilst the temperature of exposed soil at the surface rises to probably some 20° C. above that of the air, the corresponding figure for cropped land is only some 2° or 3° C. even in March, whilst in the rains it is actually lower than that of the air. Also in respect of diurnal change at 1 inch deep, whilst exposed soil suffers a change of some 20° C. in March, that of cropped land is only about 13°C. at the same depth; and during the monsoon whilst exposed soil suffers a diurnal change of some 10°C. at 1 inch deep, that of cropped land is only about 3° to 4° C.'

RUBBER AND COCO-NUTS IN THE STRAITS SETTLEMENTS.

The planting of fresh land in rubber continues in every settlement of the colony, and shows that the planters still retain their confidence. The area under rubber cultivation in Malacca is 117,200 acres.

Catch crops under rubber are being abandoned generally. The result is an enormous diminution in the output of tapioca. The area under this crop has dropped from 16,643 acres in 1912 to 7,353 acres in 1913.

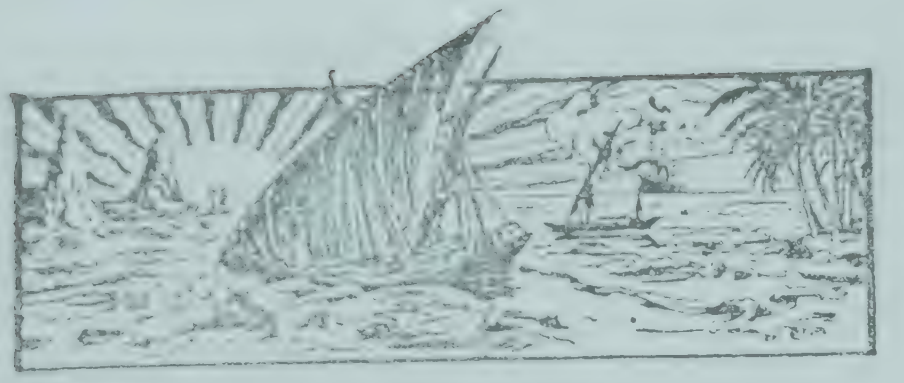
Along with the decrease of tapioca, there has been a correspondingly large diminution in pig raising. It was, and still is, the custom for squatters to rear pigs under the Chinese-owned coco-nut palms, fattening them on the *ampas*, or refuse of tapioca manufacture. In past years the pigs so raised met the whole demand of Malacca, and were sent to the Federated Malay States in large numbers. Now, however, the export has almost ceased, and to fatten the supply for local demand an import of the refuse is required.

The rice harvest was fair in Province Wellesley, and bad in Penang and Malacca. In Malacca, not only was the season unfavourable to the growing crops, but there was a smaller area than usual under cultivation, owing to the attractions offered by fairly high pay and moderately easy work upon the rubber estates.

Coco-nut estates in Singapore have largely failed to attain their estimates. In some cases this has been due to inflated expectations and a want of knowledge of the nature and yielding power of the trees on the estate, and in others to want of attention to the trees. This has especially been the case where there have been joint interests in rubber and coco-nuts.

Some large estates in the Dindings are, however, said to be doing well.

Coco-nut pests were troublesome in Singapore. There was an increase of the palm weevil in the centre of the island, and a serious outbreak of the moth *Brachartona catoxantha* in the east of the island, which will affect the crop of nuts in 1914. (*Colonial Reports*—Annual for 1913.)



GLEANINGS.

According to the Demerara *Daily Chronicle* (Mail Edition) October 1, a serious leaf disease of rubber trees has broken out in British Guiana. The disease appears to be due to *Dothidella Ulei*, which has been investigated by Mr. Petch, in Ceylon.

A portable rack for feeding animals in the field is illustrated in the *Journal of the Department of Agriculture of Victoria* for September 1915. These racks are designed to prevent waste which takes place when fodder and other foodstuffs are thrown on the ground for the animal to eat in that way.

Observations upon glanders in mules form the subject of an interesting article in the *Veterinary Record* for October 9, 1915. It appears that the mule, compared with the horse, enjoys, generally speaking, a greater immunity to bacterial invasion. To this one must attribute a more complete and a more active immunizing and protective mechanism.

In the *Agricultural News*, Vol. XIII, No. 311, p. 109, a book on date growing by Mr. Popenoe was reviewed at some length, and in connexion with this, *Bulletin No. 271* (Bureau of Plant Industry) United States Department of Agriculture, dealing with the dates of Egypt and the Sudan will be found of interest. The publication is well illustrated, and the different varieties of fruit are well described.

Further details as to the damage done in Jamaica by the August hurricane are given in the *Journal of the Jamaica Agricultural Society* for September 1915. In regard to the Parish of St. Mary and Western it is said that the whole of the standing crop of bananas was destroyed, and that these in falling damaged cacao trees by breaking the limbs. Beyond this the damage to crops was not extensive.

Notices of Judgment under the United States Food and Drugs Act are now published in collected form. The issue for September 24, 1915, shows that the work which is being done must be useful, provided it can be carried on consistently. One interesting case recorded is where a large quantity of cotton seed hulls had been added to unadulterated meal, which was then sold as such. The defendant was fined $100 and costs.

The goat as a source of milk is discussed in the *Board of Agriculture* (England) for October 1915. It is stated that there are two special qualities possessed by goats' milk which alone should make it popular: (1) the ease with which it is digested by children, and especially infants; (2) its almost complete immunity from germs of tuberculosis. It is stated that an average goat will give at its flush 3 pints a day.

Much of the work described in the Annual Report on the Distribution of Grants for Agricultural Education and Research in England and Wales during 1914-15 resembles similar efforts in the West Indies, and should receive the perusal of educational authorities in these islands. A special feature of the publication is the lists which it contains of the staffs at the various agricultural colleges and research institutes.

Ordinance No. 4 of 1913 of Mauritius, provides for the constitution and control of co-operative credit societies with the object of encouraging thrift, self-help and co-operation among agriculturists, artisans, and persons of limited means. At the end of 1913, eleven societies had been registered under the provisions of the Ordinance with a total membership of over 1,000, and a capital of about Rs.20,000. (*Colonial Reports*—Annual, No. 826.)

The Antigua and Montserrat Onion Growers' Associations have just issued an attractive handbill, which announces the excellent quality of West Indian-grown onions and the advantages which are gained by buyers from the co-operative sale and grading of this produce. Enquiries and orders should be addressed to the Secretary, Antigua Onion Growers' Association, St. John's, Antigua, or to the Secretary of the Montserrat Association in that island.

Important definitions of different artificial feeding stuffs, according to the Pennsylvania Department of Agriculture standards, is given in the Official Bulletin No. 265 of the Bureau of Chemistry of that institution. To show the character of the definitions, it may be recorded that choice cotton seed meal must be finely ground, not necessarily bolted, perfectly sound and sweet in odour, yellow, free from excess of lint, and must contain at least 41 per cent. of protein.

A trap nest for poultry is a laying nest so arranged that after a hen enters it she is confined until released by the attendant. An efficient form of this trap is described in *Farmers' Bulletin No. 682*, United States Department of Agriculture. The principle is that when the hen enters the nest her back raises the door which releases a catch or trigger and allows the door to shut. It is a very simple contrivance and presumably very effective. This form of nest is useful where the egg record of each particular hen has to be recorded.

We have received a copy of the *Twentieth Century Russia and Anglo-Russian Review*, which will be issued quarterly until after the war, and then monthly. The Review is not of immediate concern to those living in the tropics except in a general way, and our object in mentioning it lies chiefly in the fact that it is the only English publication which is devoted to the affairs of the Russian Empire. It may be mentioned that the present and first number contains an article on the future of Russia as a trade centre, by Mr. Hamel Smith, the versatile editor of *Tropical Life*.

GRENADA: REPORT ON THE AGRICULTURAL DEPARTMENT, 1914-15.

Under cover of this publication appear the general adminstration report of Mr. J. C. Moore, the Superintendent of the Department, a report by the same officer on the Botanic Gardens, and special reports on Land Settlements and Agricultural Instruction, compiled by the Agricultural Instructor, are also included.

Owing to staff changes, the greater part of the information put forward has been collected from such records as have been filed in the office. The reports therefore to some extent lack continuity and freshness, which in the following year will no doubt be remedied as a result of the fuller treatment of matters but briefly referred to in the present publication, and by the introduction of information concerning new lines of activity that have been recently introduced.

It will be noted with satisfaction that in spite of considerable disorganization, the useful work in the nurseries has been maintained. Plant distribution, on the whole, compares favourably with that of previous years, and there are indications that the demand for lime and coco-nut plants is increasing. The report which appeared in last year's edition of the present publication on chemical work is absent in the present publication. Arrangements are being made however, to appoint an agricultural chemist, and as soon as this has been effected, the useful work started by Mr. Auchinleck will be continued.

In connexion with plant pests and diseases, reference is made to the valuable results which accrued from the visit to Grenada by the Entomologist and Mycologist of the Imperial Department in February 1915. A condensed account of the information obtained on these visits appeared in the *Agricultural News* (Vol. XIV, pp. 314 and 330) under Insect Notes, and Plant Diseases, respectively.

The report on Land Settlement in the present publication shows that the older settlements are satisfactorily occupied and that the year's crops were good. Reference is made to the new St. Cyr Mountain settlement, and to important road improvements that have been effected. For several years considerable energy has been displayed in connexion with the Grenada Prize-Holdings Competition. Such a competition was again held this year, and it appears from the report that many of the holdings, which are owned by the peasants, show very satisfactory signs of improvement.

In connexion with progress in the chief industries it is stated that the season of 1914 was not a favourable one in Grenada for cacao. High winds and dry weather during the first six months resulted in a reduction of the 1913-14 crop, which was 65,510 bags, and delayed the flowering for the crop of 1914-15. It is satisfactory to note the great progress that is being made in coco-nut cultivation, for which extensive tracts of land are still available, and it is worthy of note that some increase has occurred in the case of land under sugar-cane. There are indications that in the near future the cultivation of limes may become an industry of importance in Grenada, but this is one of the subjects concerning which more will be written in next year's report.

VARIETIES OF SOUR GRASS.

There has been some occasion for suspecting that the forms of sour grass known botanically under the name of *Andropogon pertusus*, Willd., occurring in Barbados, Antigua and Nevis, may not be identical. For example, the Antigua sour grass is known to be more aromatic and less liked by cattle than is the case with that of Barbados. On account of the economic importance of the matter—apart from its botanical interest—sets of specimens of these three kinds of grass were caused to be collected by the Commissioner of Agriculture, and forwarded by him to the Royal Botanic Gardens, Kew, for the purpose of having it definitely ascertained whether they are specifically identical or not.

A letter has now been received from Kew in answer to the enquiry. In this it is stated that the specimens have been examined, and that no morphological differences can be found to distinguish them from each other. It is pointed out that the amount of aromatic oil is known to vary in other species of Andropogoneae without the variation being accompanied by morphological differentiation, and this may also be the case in *A. pertusus*. Whether such variations represent stable physiological races, or are merely fluctuations, due perhaps to conditions of habitat, is not known. In order to arrive at a decision, it would be necessary to undertake a series of experiments in the field and laboratory.

A Continuous Press.—Messrs. Toulouse & Delorieux, of San Francisco, Cal., have supplied this Office with information in regard to presses manufactured by them for extracting juice from pine-apples and other fruits. The machines are interesting. The general principle is that well known in the case of the domestic mincing machine, and is to be seen in the oil expeller now working in St. Vincent with cotton seed. It appears, however, from the makers' catalogue, that the presses they manufacture are larger than anything likely to be required in the West Indies. It may be added that this type of machine is used principally in the wine industry for extracting the juice from grapes.

Vanilla Supports in St. Vincent.—In the *Agricultural News*, Vol. XIV, No. 352, it was suggested that trials with Madura (*Gliricidia maculata*) might be undertaken to ascertain if live posts of this plant could be used as supports for vanilla. It appears that this has already been tried, and with success, by Mr. W. N. Sands, Agricultural Superintendent in St. Vincent. Vanilla has grown well on Madura in St. Vincent, and some can be seen at the present time fruiting freely.

DISEASES OF PLANTS.

NEW LIGHT OF THE WITCH-BROOM DISEASE OF CACAO.

Some twenty years ago a disease of the cacao tree, affecting the shoots as they develop from the buds, causing them to grow out swollen and distorted, and quickly killing them, appeared in the plantations of Surinam, and has since become general there with disastrous effects on the industry. The output of cacao fell from an average of 7 million lb. for the previous ten-year period to less than 2 million in 1904, and only averaged 3½ millions from that year to 1913.

After inconclusive examinations by various mycologists, C. J. J. van Hall and A. W. Drost, working in the country, made an extensive study of the disease and came to the conclusion, which has been widely accepted, that the cause of the disease, as well as of a hardening of the pods also peculiar to Surinam, is a fungus which they named *Colletotrichum luxificum*. Their paper appeared in 1907. They advocated the drastic measure of cutting back all the branches to within a short distance of the main forks, spraying with Bordeaux mixture, and then removing by hand such of the new shoots as showed signs of infection. This involved the total loss of a year's crop, and a reduction of the succeeding crops for one or two years, and did not, moreover, get rid of the disease. It has been found that thorough annual spraying, with careful removal of the diseased shoots, though less immediately effective in reducing the disease, is economically a sounder policy, and it is the one now followed by a majority of estates.

The appearance of so serious a disease naturally caused some apprehension in other cacao-growing countries. In 1911 Mr. J. B. Rorer, Mycologist to the Trinidad Board of Agriculture, visited Surinam for the purpose of acquainting himself with the appearance of the disease in the field, and was able to report on his return that it was different from any disease occurring in Trinidad. In 1913 he paid a longer visit, as a consequence of which he drew attention to the fact that the mycelium found in the diseased shoots has clamp-connexions which show that it belongs to another division of fungi than that containing van Hall and Drost's fungus. This objection was strengthened by the fact that the latter fungus occurs in Trinidad, but does not give rise to either witch brooms or hardened pods.

As a result of Rorer's criticisms, the question of the causation of the disease has been re-investigated by Dr. G. Stahel, of the Surinam Department of Agriculture, and the results are published (in Dutch, English and German) in *Bulletin No. 33* of that Department, dated September 1915.

Stahel obtained mycelium as previous investigators had done, by cutting out a surface-sterilized piece of a diseased shoot and placing it on nutrient agar. This mycelium never produced spores, and when used in inoculation experiments did not give rise to the disease. So far the work was a repetition of that of Went and Rorer, with the same results.

The infection problem was now approached from another side. Observation showed that upon the dead witch brooms three kinds of fructifications of Basidiomycetous fungi, which might be expected to have mycelium with clamp-connexions, occurred. One of these was a Marasmius, closely resembling the well-known species which causes root disease of sugar-cane. For this reason it was chosen first for experiment. Fruit bodies were fixed so that spores would fall on cacao buds. Of the first series tried, fourteen infections ensued out of forty-six buds; of the second series, seven out of nine; and of the third series nine out of ten. The white mycelium with clamp-connexions was obtained from the shoots so infected. Four witch brooms were produced by inoculation on a plantation previously entirely free from the disease. The author would seem to be justified in his claim to have absolutely proved that the Marasmius is the cause of the disease.

It has not been proved by inoculation experiments that the induration (hardening) of pods is similarly caused, but the indirect evidence to that effect is very strong.

The fungus is described by the author as a new species under the name of *Marasmius perniciosus*. The fructification is of the toadstool type, i. e., umbrella-shaped, very small, the cap usually from ¼ to ½-inch in diameter, and the stalk about the same in length. The general colour is white, with a faint crimson tint on the surface of the cap and a typical dark-red spot in its centre. The fungus has not so far been found in any other situation than diseased shoots, indurated pods, and infected flower cushions of the cacao tree.

The bearing which the discovery of the cause of the disease has upon its control is not a very direct one, but it will enable recommendations to be made with greater certainty. Obviously the removal of infective material can be more effectively carried out now that it is known exactly in what forms it occurs.

The spores of the fungus, when dried, lose the power of germination within an hour, which suggests itself as an explanation of the author's observation that shaded trees are much more susceptible than unshaded ones. It would seem that the danger of infection reaching the West Indian cacao-growing islands is very small so long as living plants and pods of cacao are not imported from Surinam.

W.N.

The clove industry of Zanzibar, according to *Colonial Reports*—Annual No, 823, dates from 1818, and in 1860 an output of about 7,000,000 lb. in weight had been obtained. In 1872 the plantations in Zanzibar were devastated by a hurricane, and therefore most of the trees in the island at present date from that time. Pemba, however, escaped, and the large plantations there are consequently much older, varying from sixty to ninety years. It is estimated (1913) that there are in both islands about 60,000 acres under clove cultivations, and about 5½ million trees in bearing.

In connexion with the suggested pork and bacon industry for the West Indies, the attention of those interested may be called to an article on the Hitchin Bacon Factory, which appears in the *Journal of the Board of Agriculture* (England) for July 1915. This gives details of treatment of the meat in the factory. In connexion with curing, it is stated that after the sides have been chilled for from thirty-six to forty hours they are dry-salted, which consists in the injection of a pickle of salt and saltpetre. If smoked bacon is required, the sides are washed and dusted over with pea flour, hung in the smoked houses, and smoked and dried with hardwood sawdust for from three to four days, according to the weather.

DOWN THE ISLANDS.

ITEMS OF LOCAL INTEREST.

ST. VINCENT. Mr. W. N. Sands informs us that during October kiln-dried corn was shipped for the first time by the Government granary to Barbados, where 161 bags sold at $2·35 (duty paid) per bag. As regards the condition of the cotton crop, it is stated that this is fair in some places, but poor in others. The picking of cotton and the reaping of arrowroot started during the month. A considerable amount of attention is being given by the Department to finding out methods of control for certain insects, especially the ants which visit onion seed-beds, concerning which some information is given under Insect Notes in this issue of the *Agricultural News*. The Agricultural Superintendent and the Assistant Superintendent, when on a visit to Cane Garden estate, in connexion with the control of the green bug (*Nezara viridula*), which attacks tobacco severely, came by chance on a large number of specimens of an egg parasite. These have since been hatched out in the laboratory, and the parasite has been liberated in the fields in the hope that it may exercise increased control.

ST. LUCIA. The cacao crop, writes Mr. A. J. Brooks, promises to be heavy, while a good stand of sugar-cane is to be seen everywhere. At the time of writing, at the beginning of November, the lime crop was still coming in and large returns were being obtained. Special work of the officers of the Department has consisted in the checking of accounts at the Government Lime Juice Factory and the paying out of bonuses. The Agricultural Superintendent, during the month of October, visited Crown Lands in the heights of Vieux Fort in connexion with the proposed planting in that place of cacao and limes. Mr. Brooks states that it is intended to commence laying out a permanent drainage system at Réunion: large concrete pipes will be used for passing the water below the grass roads. An appended list of the plants distributed from the nurseries shows that these totalled 1,749, of which 1,720 were lime plants, twenty-four budded oranges, three nutmegs, and two decorative.

MONTSERRAT. The weather in this island has continued to be satisfactory, being sufficiently wet to maintain growth, and at the same time dry enough to allow the picking of the cotton crop. At the time of writing, Mr. Robson, Curator at the Botanic Station, says ginning was in full swing and that the quality of the cotton seemed to be good. Mr. Robson provides very copious notes on the success and otherwise that has attended the various trials made with beans and peas. At Harris' Station the black eye pea occupying $\frac{1}{5}$-acre yielded 136 lb. of dry peas equal to about 9 bushels per acre. The first generation of the six kinds of imported Lima beans has been a failure. Seeds, however, have been saved of each kind. It is reported that two planters have become interested in the cultivation of the cowpea for shipment to Barbados or elsewhere, and that the cultivation of pea and bean crops generally is likely to find favour in this island. In regard to special work with cotton, it may be mentioned that samples of seventeen strains of cotton were sent to the British Cotton Growing Association last mail for report and valuation. Considerable interest attaches to this event, because some of the samples have lint as long as the St. Kitts long cottons, the increase in length being due apparently to a more favourable season. Affairs in connexion with the Onion Growers' Association are progressing as well as can be expected, and most of the more intelligent of the small growers have become members. The first shipment of ground nuts produced in the island was made to Trinidad by last mail. While the general outlook for this crop is not very bright, the cultivation of the Virginia Running variety for the Canadian market is worth attention.

ANTIGUA. The sugar-cane crop in the Windward district of the island requires rain. In this part of the island, writes Mr. Jackson, the crop has received a set-back during the last six weeks. In other districts the crop still continues to improve. Much work continues to be done with maize, onions and ground nuts. The Government granary was working at the time of writing, and experiments in the matter of crushing corn cobs were being conducted. At a general meeting of the Agricultural Society, Dr. Tempany addressed the meeting on the results of the Leeward Islands sugar-cane experiments for the year 1914-15. According to figures provided, the plants distributed from the Botanic Gardens were composed of 26,100 onion plants. As regards rainfall, it is stated that at the Botanic Station 3·89 inches fell during the month. For the year, 45·90 inches have been measured.

ST. KITTS. Mr. F. R. Shepherd, the Agricultural Superintendent, writes to say that the sugar-cane at the end of October was well advanced and healthy all over the island. With a continuance of the present weather conditions there is prospect of a record crop next season. On some estates the young crop is being planted, and greater care is being taken with the selection of the cuttings. On one estate particularly, all the cuttings planted have been procured from good plant canes, with excellent results as regards germination. The cotton crop is being reaped rapidly, and on some estates the bushes are being turned under with the object of getting the land ready for planting canes. The returns of lint generally are moderate, except in a few exceptional cases. At a meeting of the Agricultural and Commercial Society, a paper by Mr. Waterland the Chemical Assistant, and Dr. J. L. Shannon the Veterinary Surgeon, was read on the Feeding of Stock. Mr. Shepherd says that work contemplated consists principally at present in the laying out of the experimental plots on estates for cane varieties and their manurial treatment.

NEVIS. According to Mr. W. I. Howell, the cane crop throughout the island is looking very promising. Sugar is being made on a few estates and fair prices have been obtained in the local markets. The cotton crop, on the whole, is promising, and a good second picking is expected from many of the fields. Provision crops, on the whole, are doing well, and planting is still in progress. Small plots of Indian corn were also established during the month. Regular visits to plantations in different parts of the island have been made, and in this connexion it may be noted that Pinneys estate shipped during October 2,000 coco-nuts to Demerara for planting purposes. The manures for the second year's trials with coco-nuts at Pinneys estate were applied during the early part of the month. Rainfall for the month: 5·88 inches. Rainfall for the year to date: 40·84 inches.

The infusorial earth of Barbados is well known, and a note on the use of similar material as a soil improver, appearing in the *Agricultural Gazette of New South Wales*, for September 1915, is of interest. It appears that when added to soil it acts like a manure, the explanation being, it is supposed, that it absorbs moisture even in the form of dew. It is suggested that it might form a possible factor in dry-farming. The specially good effect of infusorial earth on grass land in New South Wales might make its trial worth while on pastures and lawns in the West Indies.

MARKET REPORTS.

London.—The West India Committee Circular, October 19, 1915.

Arrowroot—2¼*d.* to 2 5/16*d.*
Balata—Sheet 2*s.* 4¾*d.*; block 1*s.* 8½*d.*
Beeswax—No quotations.
Cacao—Trinidad, 84/6 to 86/- per cwt.; Grenada, 79/6 to 80/6-; Jamaica, 70/ to 84/6.
Coffee—Jamaica, 43/-
Copra—£25 15*s.* to £26 per ton.
Cotton—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 14*d.* to 16*d.*
Fruit—No quotations.
Fustic—No quotations.
Ginger—Jamaica, 55/- to 65/-.
Isinglass—No quotations.
Honey—No quotations.
Lime Juice—Raw, 3/; concentrated, £30; Otto of limes (hand-pressed), no quotations.
Logwood—No quotations.
Mace—6*d.* to 2/4*d.*
Nutmegs—4¼*d.* to 6½*d.*
Pimento—2*d.* to 2 3/16*d.*
Rubber—Para, fine hard, 2/5⅜; fine soft, 2/5¼; Castilloa, no quotations.
Rum—Jamaica, 4/2 to 4/9

New York.—Messrs. Gillespie Bros. & Co., October 22, 1915.

Cacao—Caracas, 18¾c. to 19½c.; Grenada, 18½c. to 18¾c.; Trinidad, 19½c. to 20c.; Jamaica, 17c. to 17½c.
Coco-nuts—Jamaica and Trinidad selects, $30·00 to $32·00; culls, $19·00 to $21·00.
Coffee—Jamaica, 7½c. to 11½c. per ℔.
Ginger—13½c. to 16c. per ℔.
Goat Skins—Jamaica, 44c.; Antigua and Barbados, 42c. to 44c.; St. Thomas and St. Kitts, 39c. to 41c. per ℔.
Grape Fruit—Jamaica, $2·50 to $3·50.
Limes—$4·50 to $5·50.
Mace—34c. to 47c. per ℔.
Nutmegs—11c. to 11½c.
Oranges—Jamaica, $1·50 to $3·25.
Pimento—3½c. to 3¾c. per ℔.
Sugar—Centrifugals, 96°, 4·39c.; Muscovados, 89°, 3·74c.; Molasses, 89°, 3·61c., all duty paid.

Trinidad.—Messrs. Gordon, Grant & Co., October 18, 1915.

Cacao—Venezuelan, $18·00 to $18·50; Trinidad, $18·75 to $19·25.
Coco-nut Oil—81c. per Imperial gallon.
Coffee—Venezuelan, 10c. to 12c. per ℔.
Copra—$4·25 to per 100 lb.
Dhal—$6 50.
Onions—$3·00 to $3·50 per 100 lb.
Peas, Split—$9·00 per bag.
Potatoes—English $1·25 to $1·50 per 100 ℔.
Rice—Yellow, $5·80 to $6·25; White, $6·00 per bag.
Sugar—American crushed, no quotations.

Barbados.—Messrs. James A. Lynch & Co., Ltd., October 30, 1915; T. S. Garraway & Co., November 2, 1915.

Arrowroot—$4·50 to $4·60 per 100 ℔.
Cacao—$15·00 to $16·00 per 100 ℔.
Coco-nuts—$20·00 husked nuts.
Hay—$1·70 to $1·90 per 100 ℔.
Manures—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $85·00 to $95·00 per ton.
Molasses—No quotations.
Onions—$7·00 to $10·00 per 190 lb.
Peas, Split—$10·00 to $12·50 per 210 ℔.; Canada, $5·40 per 120 ℔.
Potatoes—Nova Scotia, $4·87 to $5·00 per 160 ℔.
Rice—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
Sugar—Muscovado centrifugals, $3·60 to $4·25.

British Guiana.—Messrs. Wieting & Richter, October 16, 1915; Messrs. Sandbach, Parker & Co., October 15, 1915.

ARTICLES.	Messrs. Wieting & Richter.	Messrs. Sandbach, Parker & Co.
Arrowroot—St. Vincent	——	$9·50
Balata—Venezuela block	——	——
Demerara sheet	——	——
Cacao—Native	15c. per ℔.	21c. per ℔.
Cassava—	$1·20	——
Cassava Starch—	——	——
Coco-nuts—	$10 to $15 per M.	$18 per M.
Coffee—Creole	12c. to 13c.	14c. per ℔.
Jamaica and Rio	14c. to 15c. per ℔.	14c.
Liberian	——	10c. per ℔.
Dhal—	$6·00	$6·50
Green Dhal	——	——
Eddoes—	$1·20	——
Molasses—Yellow	None	——
Onions—Teneriffe	——	——
Madeira	——	6c.
Peas—Split	$12·00 to $12·50	$12·00 per bag. (210 ℔.)
Marseilles	——	——
Plantains—	24c. to 40c.	——
Potatoes—Nova Scotia	$4·00 to $4·50	$4·00 to $4·50
Lisbon	——	——
Potatoes—Sweet, B'bados	$1·44	——
Rice—Ballam	No quotation	——
Creole	$5·50 to $5·75	$5·50 to $5·75
Tannias—	$3·36	——
Yams—White	$3·00	——
Buck	$3·12	——
Sugar—Dark crystals	$3·65 to $3·75	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
Timber—Greenheart	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW
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IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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The Museum in Practice.

A MUSEUM may be great or small, imposing or insignificant-looking, a huge national institution or a mere case of collections in a school; but to be of real service it must have definite objects, and those who visit must do so with a definite purpose.

One is reminded in relation to the above consideration of some of the uses and abuses of the larger institutions. We may take the British Museum as an example. Here are to be found magnificent collections pertaining to every branch of art, literature and science, and in charge of these, various authorities of high standing. These authorities are in a position to give information to those who may require it (chiefly investigators), and great use is made by investigators of the representative collections in all departments of knowledge, and of the services of their distinguished curators. This is perhaps only fully realized by those engaged in scientific work in which from time to time it is found necessary to refer to the large museums on questions of the exact identity of specimens. If, however, we turn from this inner academic use unknown to the wider public and examine the so-called popular benefits conferred by such an institution as the British Museum upon the nation, we meet with less pleasing results. A great number of visitors parade the galleries with mechanical thoroughness but leave too faintly enlightened upon any subject or object of interest other than those which may perhaps attract the eye on account of some unimportant feature of display or mystery. A writer of some repute has said that his early and only impression of the British Museum is being packed off in charge of a nurse to spend the day there as a punishment for some piece of misbehaviour. This is not merely typical of the British Museum. The Zoological Gardens, the Royal Gardens at Kew, and many other public establishments which come within the modern meaning of the term a museum are also very often abused in this way. But instead of making these places a nursery or a place of temporary confinement for children, it would surely be wiser to encourage children to visit them for the intellectual interest that everywhere abounds. It is surprising how few adults attempt to explain anything that

really matters in conducting children, and especially their own children through museums and gardens. One can only explain this in terms of want of knowledge and imagination. The pity of it is that it happens at a time when the child's mind is specially impressionable, at a period when some latent attraction may be aroused which will later on lead to a useful intellectual career.

One of the most encouraging aspects of recent years is the popular guide system by means of which parties are conveyed around museums or gardens by a guide who explains. It has already been the means of liquidating the stored-up capital of fact that has lain for years untouched by the general public. Of enormous value is this system in the teaching of geography, and one is reminded in this connexion of the adoption of the method at the Indian and Colonial Galleries at the Imperial Institute where the London County Council school children are being shown for the first time that the tropical colonies can produce sugar as well as Germany, and that the principal source of Para rubber is the British East and no longer Brazil.

As already pointed out, the efficacy of the service rendered by a museum is not necessarily determined by its size. In point of fact a municipal museum or even a school museum can specialize to a point unattainable in an institution where interests are naturally broader. These town museums often offer features of great local interest, and can do much good in the way of displaying local resources for educational and commercial purposes. We are naturally prompted at this point to consider what museums of this kind exist in the West Indies and whether such as exist are fulfilling the best aims and ideals. On account of its recent origin and the great interest attaching to the island in which it is situated, we may call attention to the Dominica museum as a type. It is largely economic in nature, and contains very representative collections of the different commercial products of the island. These include amongst other things a collection of Dominica fruits preserved in formalin, a collection of Dominica grasses, a series of samples illustrating the different products prepared from limes, and a corresponding series in relation to cacao. As well as these are to be found such objects of interest as a collection of tubes displaying the physical composition of Dominica soils, and on the entomological side, a good collection of Dominica moths and butterflies. The museum was originally started as a purely departmental concern for the display of agricultural products, but as the above facts will indicate, it has now obtained outside support, and is in fact now controlled by a Board of Directors. As would be expected, a museum of great interest is to be found at Georgetown, British Guiana. This is managed by the Royal Agricultural and Commercial Society. The museum contains specimens of most of the natural products of the colony, including a good collection of animals, a very fine series of Indian curios and stone implements, mineralogical specimens, photos and views. There is also a small collection of foreign animals, and an economic section containing products from all parts of the world. In Trinidad also is to be found an excellent museum containing many hundreds of interesting specimens in natural history.

The school museum differs from the above kinds in at least one essential respect. Many of the collections may be only temporary ones. That is to say, they should be periodically renewed by the students themselves. This will limit the scope of the collection to readily obtainable material. In an agricultural centre, the collection will include plants, insects and minerals, as well as certain locally manufactured products. The teacher will do well to remember that the specimens have been collected to assist him in the teaching of subjects, and should allow the different classes to handle the specimens and to write or draw descriptions of them. A school museum should be a store-room rather than a formal museum. On the other hand, careful classification and labelling should never be neglected, nor should a series be discarded for a fresh one until it has attained to some fair degree of completeness. On no account should there be any attempt to do too much. Too ambitious a scheme will show weakness in efficiency. There are so many simple things that are well worth while mastering thoroughly, that it is unwise to run the risk of creating confusion through passing on to new and less important matters too hurriedly.

This conception of a temporary museum which has already been carried into effect in several West Indian secondary schools has in particular one practical advantage, namely, its economy. There is no need to expend money upon elaborate cases or costly mountings, nor to go to the trouble and expense involved where it is desired to preserve material indefinitely. The main object is to have material on hand for teaching purposes, and the question of permanency only comes in occasionally in relation to the rarity of some particular object.

One thing one desires not to see in a museum is merely display. In some of the collections exhibited in the public libraries of West Indian towns there is no effort to explain where the interest lies. We are thinking more particularly of archæological specimens, for example, Carib implements. With these it is the deductions that can be drawn from their examination rather than their form and composition that matters most, and whenever possible these should be stated concisely on printed labels.

In a group of islands like the West Indies where practical interest is centred so largely upon natural objects, the museum ought to be a popular institution. Whether it is or not depends largely upon the ingenuity of those in charge. The same holds good in the case of botanic gardens, which may be regarded as an out-of-doors museum of plants. The recently issued guide to the Dominica Gardens may be welcomed in this connexion as an effort calculated to arouse intelligent and more extended interest in a fine collection of plants.

GUN-FIRE AND RAINFALL.

Indisputable argument against a popular belief that gun-fire may have a widespread influence on rainfall is embodied in the following article taken from *The Times* of December 21, 1914. Even in the West Indies we have heard the view expressed that the recent rainy season was a result of the war; and it is a common belief that the moon influences the weather—a matter which is also denied in the course of the following remarks:—

An impression has arisen in some quarters that the heavy and persistent rains recently experienced in this country [Great Britain] are attributable to abnormal atmospheric disturbances produced by heavy gun firing at the seat of war. The idea is by no means novel, and, like other meteorological myths (such, for instance, as the belief in thunderbolts and the supposed influence of the moon upon our weather) it seems to possess a bullet-proof hide and takes any amount of killing. About four years ago the First Lord of the Admiralty was asked in the House of Commons whether he would instruct the Fleet to carry out their heavy gun practice at some period of the year other than in the middle of harvest time, 'when the resultant heavy rain may cause serious loss to the farming community.' A similar suggestion was made at the instance of a member of the Highland and Agricultural Society of Scotland who, at a meeting of that body, moved that 'the Admiralty be petitioned to discontinue heavy gun-fire round the coasts in August and September, when clouds were about' (*sic*), the speaker adding that 'firing was apt to bring down rain, and at that time of the year fine weather was desirable.' It may be said at once that the idea is absolutely without foundation. Experiments made some years ago in America and on the Continent showed that in droughty weather no amount of concussion in the air artificially produced had the slightest effect in the production of rain.

At the present time there is one fact which should (one scarcely likes to believe that it will) at once dispose of the cherished theory. In spite of occasional displays of unwonted activity, there are no reasons for thinking that gun firing at the front is more violent than it was in the earlier stages of the war. The spell of unsettled weather should, therefore, have commenced shortly after the outbreak of hostilities. As a matter of fact, nothing of the kind took place. In August and September the rainfall in the south-east of England was, on the contrary, much below the average, and in October there was again a considerable though less marked deficiency.

As an instance of the unreliability of the notion respecting the effect of detonation upon rainfall, a correspondent of *Symons' Meteorological Magazine* drew attention some little time ago to the fact that at Shoeburyness, where at certain seasons of the year big guns are being fired almost daily, the average annual rainfall is smaller than in any other part of the United Kingdom.

THE MEASUREMENT OF LOGS OF TIMBER.

In the *Agricultural News* for July 3, 1915 (page 220), a formula was reproduced from the *Agricultural Gazette of New South Wales* which aims at giving as a rough guide to lumber men the number of superficial feet of board 1 inch thick that may be cut from a log. The accuracy of this formula has been questioned by Mr. Henry Harries, of London, and it has been found on examination at this Office that the formula was not correctly stated in the journal from which it was reproduced. The correct expression should be as follows:—

$$\frac{\left(\frac{\text{Mean girth of log in inches}}{4}\right)^2 \times \text{length of log in feet}}{12} = \text{number of superficial feet.}$$

Apart from this arithmetical error in expression, Mr. Harries objects on mathematical grounds to the principle, or rather the lack of principle, shown in the operation of multiplying square inches by feet and dividing by twelve to obtain square feet.

In place of the formula given above, Mr. Harries has worked out an expression which is free from mathematical objection, simple, and rather more accurate. This formula may be expressed in the following manner:—

'To obtain the approximate yield of 1 inch boarding in a log, divide the mean girth in inches by 5 for the number of equivalent boards (b), multiply the result by the length (l) multiplied into the diameter (in feet to the nearest decimal) (d), for the yield in superficial feet (f).'

An example may be given thus:—

Mean girth of log, 80 inches. Length of log, 30 feet.

Then, $b \times l \times d = f = \frac{80}{5} \times 30 \times 2{\cdot}1$

$= 1{,}008$

By the first formula we get:—

$$\frac{\left(\frac{80}{4}\right)^2 \times 30}{12} = 1{,}000 \text{ superficial feet } (= f).$$

SUGAR INDUSTRY.

THE ANTIGUA SUGAR FACTORY.

In the recently issued number of the *West Indian Bulletin* (Vol. XV, No. 2), there appears a review by Dr. Francis Watts of ten years' work of the Antigua Sugar Factory (Gunthorpes). Seeing that some measure of Government assistance was given to this factory with a view to obtaining information, from actual working, of the manner in which modern factories might be substituted for the muscovado works existing in the smaller colonies, and whether this substitution would prove both a safe and sound form of advance, results of ten years' working are of particular significance.

The conditions under which the factory was established are stated, and its equipment both at the outset and at the present time detailed.

It had its origin in a series of agreements between a group of owners of sugar estates and a Company formed in London. Under these the Company agreed to erect and work a sugar factory capable of making not less than 3,000 tons of sugar in a season of 100 working days, and the estates' proprietors agreed to supply the canes from stated numbers of acres for a perod of fifteen years. They were to receive as a first payment for their canes the value of 4½lb. of 96° sugar for every 100lb. of canes, and at the end of each season they were to receive a further payment resulting from the division between the cane suppliers of one-half the profits of the factory after proper charges had been made for working expenses, interest and sinking fund. Should the price of sugar be such that the first payment on the 4½lb. basis failed to reach 10*s.* per ton of canes, then the first payment was to be made up to that sum at the close of the season before any division of profits.

It is shown that the history of the factory has been one of steady growth, as indicated by the output of sugar in each year, which has been as follows:—

1905	1,634 tons	1910	5,390 tons
1906	2,349 „	1911	5,472 „
1907	4,231 „	1912	6,239 „
1908	4,696 „	1913	7,337 „
1909	3,995 „	1914	9,131 „

Full information is given with regard to the cost of the factory and its financial standing. The growth in output shown above has been accompanied by a corresponding increase in the equipment of the factory with its concommitant increase in capital cost, so that whereas in the first year of working it is stated that the cost of the factory with its railway was £45,359, in 1914 the cost had risen to £102,961.

It is shown that during this period of ten years, the total amount paid in Debenture interest was £13,661, while £6,013 was paid in interest other than Debenture interest, and the Loss on Exchange amounted to £2,359.

The total profits paid to the shareholders during this period amounted in the aggregate to £34,113. As this sum is equivalent to half profits, it follows from the terms of the contracts that a similar amount was paid to the Original Contracting Proprietors supplying canes.

Details are given showing the quantity of canes dealt with in each year, and the amount of sugar manufactured therefrom. During the whole period 477,668 tons of canes have been dealt with, and these produced 50,474 tons of grey crystal sugar, so that the output of sugar was 10·57 per cent. of the weight of cane, or one ton of sugar was made, on the average, from 9·462 tons of cane.

The price paid for canes, including the bonuses representing the cane suppliers' share of profits, has been as follows:—

Year.	Price of sugar.	The original Contracting Proprietors.		New Contracting Proprietors.	
		Price paid per ton cane.	Equal to lb. sugar per 100 lb. cane.	Price paid per ton cane.	Equal to lb. sugar per 100 lb. cane.
	£ s. d.	s. d.		s. d.	
1905	12 15 5	14 1	5·50		
1906	8 4 8	7 5	4·23		
1907	9 16 0	12 3	6·25		
1908	11 15 9	15 11	6·75		
1909	10 7 5	14 0	6·75		
1910	12 16 8	18 1½	7·07	14 6	5·66
1911	10 11 5	10 10½	5·14	12 2	5·76
1912	13 5 3	16 10½	6·37	15 10½	5·99
1913	9 8 7½	11 3½	5·99	10 8	5·65
1914	9 1 6	11 3½	6·22	10 7½	5·86

The cost of manufacturing the sugar is given in detail for each year. From this information the following summary is extracted. The total expenditure in the factory has been £130,000 or £2 11*s.* 6*d.* per ton of sugar: that on the railway in hauling canes, sugar; and supplies has been £25,425, or 10*s.* 0¾*d.* per ton of sugar; while administrative charges amount to £9,057, or 3*s.* 7*d.* per ton of sugar. The total cost of manufacturing a ton of sugar, inclusive of haulage of canes, sugar and supplies, was £3 5*s.* 1¾*d.* per ton.

Useful details are given with respect to the work of the mills and the manufacture of the sugar. These are of such general interest as to warrant the reproduction of the following table:—

Year.	Purity of diluted juice.	Fibre per 100 parts of cane.	Sucrose per 100 parts of cane.	Sucrose extracted per 100 cane.	Sugar in juice per 100 sugar in cane.	Juice lost in megass per 100 fibre.	Sugar made per 100 sugar in juice.	Sugar made per 100 sugar in cane.
1905	89·2	15·1	15·3	12·5	81·7	92·2	82·6	67·41
1906	83·0	15·2	14·1	11·3	82·7	103·2	84·3	67·51
1907	87·3	15·1	14·4	12·1	84·4	80·4	85·5	72·18
1908	86·5	15·2	14·3	12·3	85·8	71·6	89·4	76·70
1909	85·8	15·6	14·2	11·5	84·6	71·7	89·1	75·39
1910	86·8	15·9	14·7	12·5	85·5	71·1	89·0	76·10
1911	81·2	15·8	14·1	12·1	85·7	70·3	82·2	70·46
1912	83·9	17·5	14·2	12·1	84·9	59·1	87·0	73·86
1913	83·0	17·7	12·9	11·8	91·1	36·6	88·7	80·86
1914	84·7	16·6	13·5	12·2	90·6	42·8	90·2	81·72

Attention may be called to some of the salient features. It is seen that the amount of fibre contained in the canes is very high, and that in the three last years it rose to unexpected

proportions. This high fibre content is a matter of very great importance, as it tends to diminish the content of juice and of sugar, and interposes peculiar difficulties in the way of adequate mill work. In consequence of this, it is felt that the erection, for work in 1911, and including the crop of that year, of a train of mills having fourteen rollers coupled with the use of much maceration water is justified.

The efficiency of the mill work is measured by the figures given in the column of the last table, showing juice lost in megass per 100 of fibre, where it will be seen that in 1906 this amounted to 103·2, when the mill consisted of six rollers only, but was reduced to 36·6 in 1913, when the 14-roller mill was employed.

The progress of the general efficiency of the factory is measured by the last column in this table, where there is recorded the quantity of sugar produced for each 100 parts of sugar in the canes. It will be seen that this was 67·41 in the first year, when the mill train consisted of only six rollers, and that it reached 81·72 in 1914, when the mill train consisted of fourteen rollers, and a high degree of efficiency was reached in recovering sugar from the juice in the process of manufacture. It will be seen that the work is now of a high order, comparing favourably with that of factories of established repute in Java, Hawaii, and other progressive countries.

Reference to the original paper is advised for those who wish to obtain all the various details available. It may be stated in conclusion that the factory has admirably fulfilled the purpose for which it was erected: it has substituted for an imperfect, wasteful muscovado industry, a well developed and scientifically conducted one, wherein all the main and important facts are accurately recorded, so that it may be seen what degree of efficiency is obtainable in these colonies, and to what extent it may be expected that such progress as is indicated may prove remunerative.

To establish and bring to such a high degree of efficiency a modern sugar factory in a small island like Antigua, where there was little in the way of previous experience to guide those responsible, and where peculiar and unexpected difficulties, both in connexion with the factory and arising from the character of the canes to be manipulated, had to be overcome, is a fact of which those responsible may be reasonably proud.

The College of Agriculture, of the University of the Philippines, the only large agricultural college to be found in the tropics at present, is in its sixth year, and has a student body of nearly 400. It occupies a tract of about 127 hectares on which every important crop in the Philippines is under cultivation. It is urged that the public should recognize this college of agriculture as the Philippine Central Agricultural Experiment Station, and permit it to develop close relationships with the various branch stations of the islands. It may be mentioned in connexion with this, that a parallel combination of official experimental work and unofficial educational effort is what is urgently required in the West Indies.

Those who are engaged in work pertaining to the measurement of the loss of water from growing plants will peruse with much interest an article in the *Journal of Agricultural Research* (Vol. V, No. 3), entitled An Automatic Transpiration Scale of Large Capacity for Use with Exposed Plants. Some need has been felt for serviceable apparatus in dealing with transpiration of the sugar-cane and similar tropical plants, and it would appear that this paper with its references to transpiration balances and self-recording instruments may contain the necessary information, or at least suggestions.

LIME CULTIVATION IN ST. LUCIA.

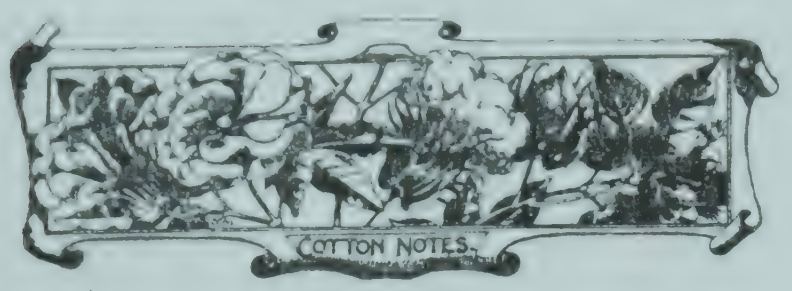
The Agricultural Department of St. Lucia has just issued a new leaflet (No. 4) dealing with the practical side of lime cultivation, which contains special notes concerning common errors of practice in that Colony. The leaflet is written in a popular style and should serve the purpose for which it is intended. With good reason considerable space is devoted to questions of wind-breaks, and several diagrams are included to show how these mitigate the force of the wind. Tillage and drainage are also subjects dealt with. At the end of the leaflet Mr. A. J. Brooks, the writer, provides a series of 'donts':—

(1) Don't plant limes without wind-breaks.
(2) Don't plant limes too deeply.
(3) Don't plant limes too close together.
(4) Don't plant a larger area than can be properly cared for.
(5) Don't carry lime plants about with their roots exposed to the sun and then complain that 'they did not grow'.
(6) Don't forget where you have planted limes, as they will need after attention.
(7) Don't allow suckers to develop.
(8) Don't neglect to till the soil if you want quick returns.
(9) Don't ruin your cultivation by neglecting to fork heavy soils.
(10) Don't fork when the trees are bearing.
(11) Don't neglect to drain thoroughly.
(12) Don't run the drain straight down the slope.
(12) Don't forget that lime plants must be fed with an abundance of manure if large annual crops are desired.

Obituary Notices.—The death is recorded in the *Tropical Agriculturist* of Dr. R. H. Lock, M.A., Sc.D., late Assistant Director of the Royal Botanic Gardens, Ceylon. Dr. Lock had a highly successful career at the University of Cambridge, and in Ceylon, before he became more closely engaged in administrative work, carried out important botanical investigations in connexion with Mendelism. Previous to his death Dr. Lock was Inspector under the Board of Agriculture and Fisheries, London, in which city he resided after relinquishing his appointment in Ceylon in November 1912.

In the *Journal of the New York Botanical Gardens* an obituary notice appeared on the late John Francis Cowell, who was Director of the Buffalo Botanical Gardens for over twenty years. He made many trips to tropical America, the first of which was to Jamaica. He traversed a considerable part of that island, and made very extensive collections. During the period from August 29 to October 12, 1901, he visited the island of St. Kitts in company with Dr. N. L. Britton, and on this tour good general knowledge was obtained of the flora of that island. The deceased botanist also visited St. Croix and St. Martin, as well as the Isthmus of Panama. His botanical explorations have also been considerable in Cuba and Porto Rico.

We learn from the English *Journal of the Board of Agriculture* for October 1915, that Great Britain, in normal times, exports over three-fourths of her total production of sulphate of ammonia. Such export will now be restricted, as sulphate of ammonia as well as other fertilizers can only be exported under license.



COTTON.

WEST INDIAN COTTON.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 20, is as follows:—

Islands. We have had a quiet market with some demand for the selection of the odd bag classing Fully Fine, of which the supply is limited, and also for Fine off in preparation.

The receipts of odd bags continue to consist principally of Fine, for which there is little demand, but which the Factors most positively refuse to sell below the prices ruling for fancy Georgias and Floridas.

There is a limited demand for Planters' Crop lots, but at prices below the views of Factors.

We quote, viz.:

Extra Fine	28c. = 17½*d.*	c.i.f. & 5 per cent.
Fully Fine	26c. = 16½*d.*	,, ,, ,, ,,
Fine	25c. = 16*d.*	,, ,, ,, ,,

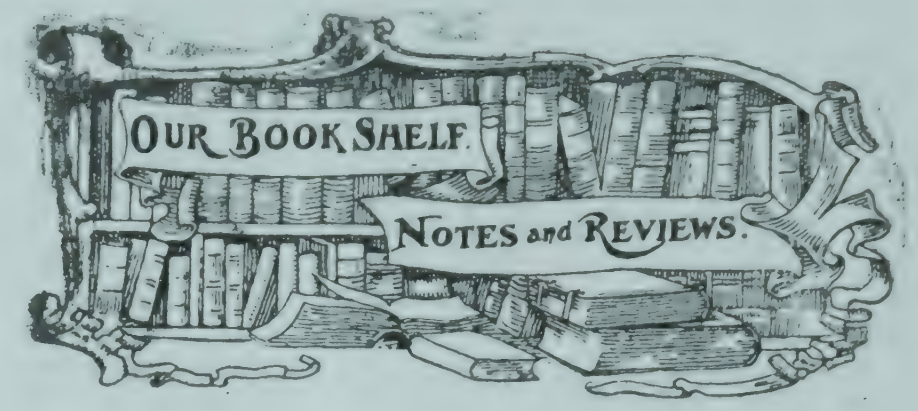
Floridas and Georgias. There was again a good demand this week taking all the daily offerings on the Savannah market at our quotations. There was also reported a good demand in the interior, paying equivalent prices. The market both in Savannah and in the interior closed very steady, with Factors refusing to sell except in round lots taking all grades, the demand being chiefly for the lower grades, say, Choice and Extra Choice, which are comparatively scarce. Factors are refusing to sell unless the Fancy is taken along with them.

We quote, viz.:

Fancy	25½c. = 26½c.,	landed.
Extra Choice	24½c. = 25½c.,	,,
Choice	23½c. = 24½c.,	,,

The exports from Savannah for the week were, to Northern Mills 949 bales, Southern Mills 280 bales, and from Jacksonville to Northern Mills 3,041 bales.

Mr. W. Lawrence Balls.—The Commissioner of Agriculture has received a letter from Mr. W. Lawrence Balls, M.A., formerly Botanist to the Government of Egypt and well known on account of his researches connected with the cotton plant, to say that he had recently been appointed on the staff of the Fine Spinners' and Doublers' Association as a consulting scientist to conduct investigations, presumably in regard to the physical properties of lint. Mr. Balls will be moving from Cambridge to Manchester at the end of this year. Although his work will lie mainly in mechanical directions, it is not unlikely that Mr. Balls will have occasion to visit the West Indies in connexion with his studies. It will be obvious to cotton growers in the West Indies, and to all those interested in fine staple cotton, that the position of the industry is likely to be greatly strengthened through the Fine Spinners having secured the services of so eminent an investigator.



THE DEVELOPMENT AND PROPERTIES OF RAW COTTON. By W. Lawrence Balls, M.A., late Fellow of St. John's College, Cambridge, formerly Botanist to the Khedivial Agricultural Society of Cairo, and to the Egyptian Government Agricultural Department. *A. & C. Black, Ltd.*, London. Price 5*s.* net.

In a former work entitled, The Cotton Plant in Egypt, Mr. Balls put forward a botanical study of the cotton plant which attracted wide attention, not only on the part of those interested in cotton, but also of botanists and students of agricultural economics generally; the work was felt to be highly suggestive of lines of study which might be found applicable to many important crops.

In the present work under review, Mr. Balls has addressed himself to a different audience: he writes for those who may be in any way interested in cotton whether as growers, dealers or spinners, and one of his first objects is to endeavour to find terms and expressions which shall enable those who are interested in cotton in these or other ways to understand each other. To the outside world this would seem an easy task, but something of the difficulty may be realized if it is known that many of the expressions used in connexion with cotton have connotations far different from their commonly accepted meanings. For instance, when a cotton broker or grader speaks of 'strength', it is found that the property he refers to has little connexion with the breaking strain of the individual fibres; similarly, the broker's reference to 'fineness' has little or no relation to the diameters of the cotton fibres; and so on for a number of properties. It is evident, therefore, that those connected with cotton in its several and various aspects are talking in different languages, and are very liable to misunderstand each other.

Part of the task of the book is to endeavour, in some degree, to find common terms for observed phenomena, which terms may be readily understood.

The book, in a succession of six chapters, deals with (I) The development of pedigree. (II) The development of the plant. (III) The development of the boll (i) Structural. (IV) The development of the boll (ii) Environmental influences. (V) The development of commercial lint; and (VI) The development of cotton growing.

The studies under these various and comprehensive heads are put forward in a manner which may be perfectly understood by non-botanical readers, though the style is precise, and no attempt is made to give the matter what may be termed a popular aspect; the book is written for workers and students, and will make forceful appeal to them.

In these studies Mr. Balls is admittedly under the influence of the conditions attending the growth of the cotton plant in Egypt, chief amongst which is the uniformity of the environment; the progress of the seasons is uniform as regards temperature; there is practically no rainfall, all the water is derived from irrigation works, so there are no perplexing

problems arising from seasonal irregularities and abnormal rainfalls. This is fortunate, for it has enabled the author to unravel many of the phenomena of growth and development, and to put them forward in a manner which will enable other workers, less favourably situated in this respect, to apply his reasonings to the solution of their own problems. In this respect the book is of indispensable value to those interested in cotton growing in other parts of the world, and particularly to us in the West Indies, with our new and developing industry.

It is impossible in the space of a brief review to allude to all the points to which special attention might well be directed, but as an illustration of the practical interest of the book, attention may be drawn to the excellent studies of the growth and development of the boll and its contents. The information given in the text of the book in this particular is summarized in an interesting and useful table, showing the chronology of boll development, and this table is supplemented by a most instructive series of drawings, arranged in two sheets, showing in the first the development of the flower bud and the formation of the seed, and in the second series, the structural development of the boll and of the seed. These diagrams contain a wonderful amount of information, much of it the outcome of the author's own work, and the form of presentment is such that the facts impress themselves upon the mind of the student with remarkable facility and clearness, and enable him to understand a wide range of facts connected with the development of essential details in the life of the cotton plant.

The statistical method of investigation is followed throughout, the object being to present each feature, as far as possible, in terms of definite measurements, thus replacing opinion by measured fact. In this way the effect of the environment on the developing boll and its contents is studied, and two complete series of observations are given in detail, the results being stated numerically, and in the form of curves. The importance of the remarkable root-system of the cotton plant, and the equal importance of the water supply and its relation to the root are brought out, and it is shown that, under Egyptian conditions, the limiting factors of growth are intimately associated therewith.

In all this the development of the lint, the conditions which determine its length, its strength and fineness, are presented to the student in a most illuminating manner. It is evident that this work will have far-reaching effects on the investigations of other observers, who are bound to be stimulated by the observations here presented.

Underlying the whole of the work is the theme that uniformity of character is the matter of most concern to the user of cotton. A cotton uniform in its characters is good cotton for some purpose or other, while cotton lacking in uniformity is poor cotton notwithstanding the excellence of some of its features. This being so, the author insists that the improvement of cotton is likely best to be achieved by developing pure strains, and from these pure strains procuring supplies of pure seed for general cultivation. In separating the pure strains it is necessary to have regard to the properties that are measurable, and to make patient statistical record of all these characters. How this is to be done the book plainly indicates. The author's own summary in this particular may be quoted. He says: 'Roughly summarized, but with most rigid definition of every word, it consists in obtaining seed from single plants by self-fertilization exclusively, until plants are found which give offspring all exactly alike constitutionally in every visible and measurable feature.'

Useful remarks are made concerning the methods of conducting field experiments, and the recording and interpreting the results; these are calculated to be of much service to other investigators, enabling them to increase the accuracy of their work, while indicating to them some of the limitations attaching to it, and what degree of credence may reasonably be given to properly conducted experiments.

An appendix containing an outline of the methods of investigation employed by the author, constitutes one of the most useful parts of a generally useful book. The methods are characterized by their endeavour to secure a high degree of accuracy, while many devices are suggested whereby the labour of keeping the vast number of records may be minimized, at the same time maintaining the full degree of accuracy. As a matter of general interest reference may be made to the author's method of determining lint length for comparative purposes. This is not done by measuring the pulled lint, but by measuring the lint after combing out but still attached to the seed. The lint is combed into a halo chiefly around the basal portion of the seed, and its length is measured as follows.

'The seed with its flat halo of lint is laid on a dark back-ground, held down by the forefinger of the left hand resting on the seed ; one leg of the dividers is then brought up against the butt of the seed, and the other is swung around and adjusted until it moves along the edge of the halo. Successive measurements made in this way on the same seed vary only 1 millimetre, so that the halo edge is obviously quite definite, even in poor cotton.'

The refinements of method used in the more detailed examination of lint will appeal with full force to those who are making investigations on this subject. There is a fund of information, much of it associated with attractive and clever devices, and throughout there is a striking desire to economise labour and time.

As the outcome of intimate comparison between the results obtained by himself and by professional graders dependent upon finger tests alone, Mr. Balls expresses profound regard for the accuracy attained by the latter. He remarks that 'while we amateurs are working out the lint length of a sample by ten minutes of effort the grader will satisfy himself in as many seconds. . . . and it should be remembered that any person who has spent less than ten years in the daily grading of cotton, and has not in addition been born with the instinct implanted in him, is an amateur at cotton grading.'

The limits of space available preclude reference to a great number of points of much interest, but everyone interested in cotton, whether as a ginner, an investigator, or a spinner, should obtain the book, which will afford him both pleasure and profit in its persual, while it is likely to be kept at hand for ready access as a text-book to be frequently consulted.

DEPARTMENT NEWS.

The Imperial Commissioner of Agriculture left Barbados on December 1 by the C.R.M.S. 'Chaleur' for the purpose of paying an official visit to St. Vincent.

Mr. H. A. Ballou, M.Sc., Entomologist on the Staff of the Imperial Department of Agriculture, returned to Barbados on November 24, by the S.S. 'Denis', after three months' leave of absence spent in the United States of America.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents' and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial to this issue discusses the uses of museums in relation to scientific work and agricultural education.

A valuable summary of ten years' results of the working of the Antigua Central Sugar Factory appears on page 388.

A new book on the development and properties of raw cotton is reviewed on page 390.

New manurial experiments with coco-nuts at Nevis are described on pages 398 and 399.

Insect Notes in this issue deal with root borer as a factor in manurial experiments with cane: under Plant Diseases will be found an article on the use of Burgundy mixture as a substitute for Bordeaux.

Ajowan Seeds for Thymol in the West Indies.

Mention has been made in the present volume of this journal of the increased demand for the antiseptic thymol obtained from ajowan seeds (of *Carum copticum*) on pages 313 and 73. It was stated that the Imperial Commissioner of Agriculture had obtained seed of this plant through Kew; and that this had been distributed for trial in all the Windward and Leeward Islands. We are now informed that the seed received in St. Lucia germinated well. The plants grew to an average height of 2 feet, and flowered freely. Mr. Brooks, the Agricultural Superintendent, states further that, although the rains rather beat them down, sufficient seed has been secured to continue the trials.

In forwarding the original seed, Mr. A. W. Hill, the Assistant Director of Kew, pointed out that the ajowan crop in India is a cold-weather crop, which would appear to make it scarcely suitable for cultivation under the strictly tropical conditions of these islands. The St. Lucia trials, however, indicate that the general climatic conditions there may not be unfavourable.

Reports from the other islands have not yet been received.

Pig Raising in the Tropics.

Great success has attended efforts to improve hog breeding in the island of Guam (Philippines), and it is regarded as the most interesting and most encouraging line of animal breeding. The rapid increase in this class of stock, according to the Report of the Agricultural Experiment Station, 1914, renders possible a distribution of half-blood boars to the various localities of the island. The most popular breed for improving local strains is the Berkshire, and it is said that the results of disseminating the blood of the Berkshire breed is most encouraging.

In connexion with the present subject of improving the local breed of pigs attention may be called to the valuable importations of pedigree animals into British Guiana, and to the satisfaction evinced by the local press as to the benefit of these importations to the public.

In a recent issue of the Barbados *Advocate* attention was called to a report by Mr. E. H. S. Flood, Canadian Trade Commissioner, in which reference was made to the scarcity of pork in Canada. On the basis of information published by the Imperial Department of Agriculture for the West Indies, Mr. Flood considered that it should be possible to inaugurate a trade in this community, for there are large areas in the West Indies which will support pigs but will not as satisfactorily produce profitable crops.

The whole question of pig raising in the West Indies will be found comprehensively dealt with by Dr. Francis Watts, C.M.G., in the *West Indian Bulletin*, Vol. XIV, No. 4. A shorter account of the proposals appears in the *Agricultural News*, the present volume, page 118.

Ducks as a Preventive of Malaria and Yellow Fever

The usefulness and value of 'millions' in the destruction of mosquito larvae, and consequently in checking the spread of yellow fever and malaria in tropical countries where outbreaks of these occur, are now generally well known. The *Colonial Journal* for October 1915 refers to ducks as a preventive of malaria and yellow fever, and gives evidence of their value in this respect.

'Ducks, which occur in all regions of the Globe, are among the greatest enemies of mosquitoes, and consequently of yellow fever and malaria. Their value in this respect has been determined as follows: By means of dams two pools of equal area were made in a stream. Ducks were placed in one and fish in the other. The former was speedily cleared of mosquitoes, whilst the second continued to maintain the insects in all stages of development. Wild ducks were then introduced and found to prefer the insects to all other foods. At the end of twenty-four hours no pupae were found in the pond, and after two days all the larvae had been destroyed. These experiments confirm the observations of William Lockwood, who found that the duck was particularly adapted to devouring the the larvae on the surface of water, and of McAtee, who found mosquitoes in the gizzard of a wild duck.

'The mosquito has numerous animal enemies, of which the duck is the most widespread and consequently the most suitable to clean up unhealthy marshy districts which it would be too costly to drain.'

Trade of South Africa in 1914.

In his report on the trade of South Africa during 1914, the Officer in charge for H.M. Trade Commissioner for South Africa states that trade up to the outbreak of war was below normal. The reasons for this, in their order of increasing importance, were: drought, the slump in the ostrich feather industry, and the after effects of the labour troubles in January 1914. In the latter part of the year, the European war and the rebellion in South Africa still further affected trade. The total trade of the Union last year amounted to £91,615,144, as compared with £109,456,629 in 1913. Of the 1914 total, imports of general merchandize accounted for £31,168,665, as compared with £38,408,598 in the preceding year.

In regard to the export trade, it is mentioned that the total exports of South African products declined by about 18 per cent. (i.e., from £65,114,634 in 1913 to £53,495,076 in 1914), practically the same proportional decrease as in the case of imports. Exports of foodstuffs increased by over £440,000, an increase which would have been greater but for the considerable amount of produce used for the maintenance of troops in the Union. Exports of mineral products have suffered from the effects of the war, although it is safe to say that a decrease would have had to be recorded even had the complications in Europe not arisen.

As to the future of South African trade, it is observed that, although there is need for caution on the part of business men, the present depression is mainly artificial. South Africa has a great recuperative capacity and cannot help rising again. Gold is the main product of the Union, providing about 60 per cent. of its exports; next in order of importance comes wool, and fluctuating values cannot greatly affect the possibilities of trade in this product, as there is always more or less an eager market for the qualities of wool which South Africa can produce. Ostrich feathers are far less stable as a product than any others now being dealt with. And, it may be added, the possibilities of South Africa as a meat-producing and exporting country have hardly yet been realized.

The foregoing information has been abstracted from *The Board of Trade Journal* for October 14, 1915.

A Sporting Fern.

A very interesting question in botanical biology is that of bud variations, or 'sports' as gardeners call them. For some hitherto unexplained reasons, a plant may produce from one of its leaf buds a shoot which differs considerably from the rest of the present plants in foliage usually, sometimes also in flower and fruit. Such sports are usually carefully observed by a professional horticulturist; and in many cases they have become the origin of improved varieties of the present plant, or of varieties valued for their striking individual appearance. On the other hand, many of these bud variations are not stable, that is they are unable to give rise to a series of individuals perpetuating their distinctive characters. In some instances, however, the original 'sport' gives rise to a series in which bud variation seems to run riot, each individual apparently being liable to throw out many different sports, some of them becoming stable, and others reverting to the form of their original parent.

A striking example of this riotous variation is afforded by 'sports' first obtained from *Nephrolepis exaltata*, a fern of world-wide tropical distribution. According to an article by R. L. Benedict in the *Journal of the New York Botanical Garden* for September 1915, a sport of this fern was first propagated in a Philadelphia garden. It was afterwards specially cultivated by a Boston garden, and still further developed by Pierson in his fern house on the Hudson. The result has been that the original sport has given rise to more than forty well differentiated varieties. One can hardly imagine that some of these wonderfully graceful varieties of 'Boston Fern', as they are commonly called, the long drooping fronds of which present the appearance of the finest filagree leaf work could be the progeny of the somewhat stiff *Nephrolepis exaltata*, with its simply pinnate, or at most twice-pinnate fronds. The sports have not up to the present in any case borne any fertile sori. Thus the multiplication of individual plants is entirely by division of the rhizome.

INSECT NOTES.

THE ROOT BORER OF SUGAR-CANE AND ITS EFFECT ON MANURIAL EXPERIMENTS.

The report issued by the Barbados Department of Agriculture on the sugar-cane experiments for the season between 1913-1915 has recently been issued. Parts I and II of this report deal with Manurial Experiments with sugar-cane in Barbados 1913-1915.

These reports do not ordinarily touch upon the investigations of the depredations of insect pests, but the root borer has exercised such a marked influence on the results of the experiments that a short account of its work is recorded. A similar brief statement was presented in the last previous report of the series, viz. that for 1912-14.

The root borer (*Diaprepes abbreviatus*) has for several years been recognized as a serious pest of sugar-cane in certain localities in Barbados, but it is only recently that it has been found on the lands where the manurial experiments of the Local Department are being carried out in sufficient numbers for it to be considered a pest of importance. For the past three years, the period covered by the last two reports, the depredations of this insect have had a serious effect on the results of the experiments.

The paragraph reproduced below from the report mentioned above indicates the manner in which the canes were injured, and shows the remedies adopted to reduce the numbers of the insect in the infested fields.

As will be seen, the control measures include the digging out of the stumps and killing the grubs. The other important measures which are strongly recommended for the control of this pest are the collection of the eggs, the collection of the adults when they appear and a system of crop rotation. This last course is not available for these fields since these manurial experiments are carried out on the basis of the same manurial treatment being applied on the same plot, with the same crop, season after season.

The manurial experiment plot is stated to be approximately $1\frac{1}{4}$ acres in extent and it will be seen from the figures given below of the number of grubs collected that the attack was one of considerable intensity, and they indicate the serious effect of this insect on the yield of canes on the general cultivations of the sugar-cane estates in the island, where the root borer occurs in large numbers, it being stated that the grub of the root borer 'attacked the canes in the manurial plots this season to such an extent as to render it impossible to draw any definite conclusions from them.'

The root borer has been known as a pest of sugar-cane in Barbados for several years, and recently it has been more and more in evidence in different sections of the island, until at present it occurs in almost all districts.

Instances are not wanting of an almost complete control being obtained by collecting the eggs, collecting the adults, digging stumps as soon as the crop is off, and, this is very important, the rotation of crops.

The same problem, perhaps in a less degree in intensity, at present confronts sugar-cane growers in St. Kitts and Antigua, the pest being the closely related *Exophthalmus esuriens*, which, so far as known, has the same habits and life-history as *Diaprepes abbreviatus*, and sugar-cane planters throughout the West Indies should enter into an organized and concerted campaign against the attacks of these insects.

The following paragraph is quoted:—

'The results are given in Tables II to V. As will be seen therefrom the results from most of the plots are so different from those of previous years, with the exception of last year, and so conflicting with those of some of the other plots as to leave no doubt but that this year a very disturbing factor has again been present, and which has masked the true results of the manuring. This disturbing factor was, as in the previous year, the grub of the root borer (*Diaprepes abbreviatus*, Linn.), which has attacked the canes in the manurial plots this season to such an extent as to render it impossible to draw any definite conclusions from them. Even before the canes were fully matured some were seen to be drying, and on two occasions clumps amounting altogether to forty-nine and to be reaped or they would have dried up and been lost. From the basal portions of these clumps 1,022 larvae of the root borer were obtained. As soon as the remainder of the canes were mature they were reaped in the usual manner, and as quickly as pssible after this the basal portions of each clump were dug up, cut into pieces, and the larvae extracted and killed. At the same time the old cane holes were dug out two feet square and ten inches deep, and all the larvae found in the soil killed. In no instance was the basal portion of any clump of canes of the manurial plots free from the pest, and it may be here stated that, including those mentioned above, 8,059 larvae were killed, or over an average of five larvae to the clump. The digging out of the basal portions of the clumps, and enlarging the old cane holes to search for and kill the pest is a somewhat expensive method of dealing with the attack, but owing to the importance of freeing the manurial plots as far as possible from this pest, it was necessary to take the measure most likely to be effectual.'

H.A.B.

According to information received at the office of H.M. Trade Commissioner in South Africa, from the Commissioner of Customs and Excise at Pretoria, interesting experiments with cotton growing are about to be undertaken in Natal, with a view to ascertaining the more suitable variety for cultivation there. The planting and cultivation are to be supervised by the Government Officer in charge of tobacco and cotton investigations in the Province. The Government has erected a ginning plant at Durban, where seed-cotton from farmers in all parts of Natal and Zululand will be ginned and baled ready for the market at a cost of $\frac{1}{2}d.$ per lb. on the lint. (*The Board of Trade Journal*, October 14, 1915.)

According to the Dominica *Chronicle* for November 10, the exports of lime products from Dominica up to October 31 was as follows: raw lime juice, 598,565 gallons; concentrated lime juice, 89,293 gallons; and lime juice cordial, 4,500 gallons. The figures for the corresponding period of 1914 were 304,503, 114,497 and 3,622, respectively. During the same period, 717 cwt. of citrate of lime was exported as against 4,540 cwt. in 1914. The exports of lime oil, both ecuelled and distilled, declined also, and there is also a general reduction in the exports of fruit such as coco-nuts, limes, bananas and oranges.

SNAILS AND BLACK BLIGHT.

Observations recently made in a garden near Bridgetown on the habits of a certain common snail which eats the layer of sooty mould or 'black blight' from the leaves of lime and other trees have led to a comparison of the recorded instances of a similar kind.

There are several notes on the subject from Florida, where the prevalence of sooty mould on citrus trees has led to careful study and experiment with all the agencies which seemed to promise some measure of natural control. It is said that without artificial protection the snails which possess this habit rarely reduce the sooty mould appreciably on more than a few trees at a time. When they are abundant, however, well blackened trees may be entirely cleansed of sooty mould, leaving the fruit rinds and the surface of the leaves bright and glossy. The placing of straw on the ground and the hanging of pieces of burlap in the main branches are suggested as a protection for the eggs of the Florida species. It does not seem, however, that attempts to increase the numbers of the snails have had any notable success.

According to information kindly supplied by the Revd. N. B. Watson, the Barbados snail referred to is *Orthalicus zebra*, a variable species with a range extending from Magatlan to Mexico, Panama and Florida, along the northern parts of South America, and several of the West Indian islands. It is an introduced species in Barbados, and confines itself to the neighbourhood of Bridgetown. Attempts on the part of Mr. Watson to establish it in the drier parish of St. Philip have failed.

It will be of interest to learn whether this snail or other snails feeding on sooty mould have been observed in other West Indian islands.

INTRODUCING THE JACK SPANIARD INTO ST. LUCIA.

In the *Agricultural News* for September 11, page 298, an article appears on West Indian wasps, showing their distribution in the different islands, and their value in controlling certain crop pests. In view of the fact that the so-called Jack Spaniard, which is of great value in St. Vincent in controlling cotton worm, has practically died out in Grenada, and does not appear to exist in St. Lucia, it was requested by the Imperial Department that the St. Vincent agricultural authorities might make arrangements for the introduction of this wasp into the islands referred to. In both places, it was thought, the insects might prove valuable.

Quite recently a letter has been received from Mr. A. J. Brooks, Agricultural Superintendent, St. Lucia, stating that a consignment of the St. Vincent Jack Spaniard has been safely received. The box contains a large quantity of nests, and over fifty insects had hatched out during transit, and were in excellent condition. It may be pointed out that the method adopted in sending the wasps was the same as that employed when this insect was sent some years ago to Montserrat, namely, combs were sent with sealed brood carefully tied into light boxes. After its receipt in St. Lucia the box was placed in a shelter previously prepared in a banana plot, with a growing cover crop of horse beans badly attacked with worms. The wasps were liberated. Hatching continues daily, and the wasps have been observed feeding on the worms between 6 and 7 a.m., this apparently being their most active period. Mr. Brooks says that, judging from the energetic way the wasps have started work, it looks as if they may constitute the cheapest and most effective means of control of the worm, which has made it difficult, up to the present, to grow leguminous green dressing crops at Réunion.

INTERESTING CASES OF ANTHRAX.

In view of the importance of anthrax in parts of the West Indies, the following interesting cases recorded in the Annual Report of the Chief Veterinary Officer for the year 1914, to the Board of Agriculture and Fisheries, England, are abstracted:—

A number of interesting cases of anthrax have come to our notice during the year, and a short summary of each may not be considered out of place in this article:—

In February anthrax bacilli were found in a dressed carcase of beef by Veterinary Inspectors in an abattoir.

In March anthrax bacilli were also found in the hindquarters of a year-old bovine in the same abattoir.

Both carcases had been slaughtered and dressed in Ireland, and consigned to Scotland for sale.

A bullock suffering from anthrax was bled by the owner, and a dog drank a large quantity of the blood. Nine days later the dog died, and anthrax bacilli were found in specimens of its blood sent to the Laboratory.

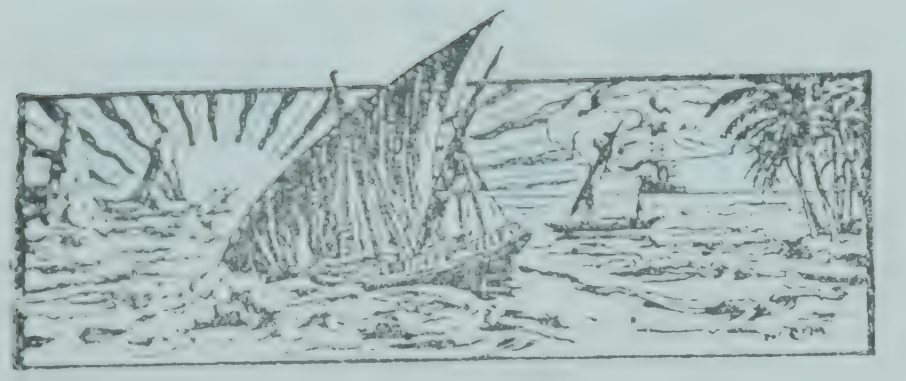
A cat also ate a portion of the carcase, and died three days later. Unfortunately, its blood was not sent to the Laboratory for examination, but it is exceedingly probable the cat died of anthrax.

In another outbreak a cat gained access to the carcase of a heifer which had died of anthrax. The cat died, and anthrax bacilli were found in a specimen of its blood when examined at the Laboratory.

The deaths from anthrax of the dog and two cats is worthy of mention in order to impress on stock owners the necessity for guarding such carcases from flesh-eating animals. The death of a dog or a cat is perhaps not very serious, but it must not be forgotten that canines and felines are capable of spreading the disease by carrying portions of the flesh over large distances.

In connexion with the editorial in this issue on the Museum in practice, we may call attention to an article on the standards and functions of museums which appears in *Nature* for September 23, 1915. This, in reviewing the report of the American Museum of Natural History, calls attention to the tendency to spectacular display and to the desirability of not confusing purely technical subjects with scientific ones. An excellent feature of some of the American museums is that in addition to lectures to children and teachers, special rooms are set apart in the museums for children's collections, while this work is supplemented by travelling museums sent round from school to school by means of motar vans. Something of this kind, it is suggested, might well be imitated in England.

A peculiarity of the camphor oil produced in the Federated Malay States is the absence of safrole to which constituent the oil produced in Japan largely owes its commercial value. It appears probable that the absence of safrole in samples so far collected is due to the fact that the distillate is obtained from young twigs and leaves in the F.M.S., whereas in the ordinary Japanese camphor oil of commerce, the distillate is derived from old wood from matured trees. The *Agricultural Bulletin of the Federated Malay States* (July 1915) from which this information is taken, adds further that a specimen of camphor oil distilled from leaves and twigs in German East Africa, also contained no safrole.



GLEANINGS.

The results of some rice cultivation experiments in Ceylon are published in Bulletin No. 21, recently issued by the Department of Agriculture in that Colony. It is shown that the yield of paddy is nearly the same for distances of transplanting from 4 to 10 inches.

An interesting botanical discussion appears in the *Archief* of the Sugar Industry of the Dutch East Indies on the question as to whether a leaf and its internode in the sugar-cane is to be regarded as a physiological unit. The author answers the question in the negative.

It is notified by the Department of Agriculture in the *Port-of-Spain Gazette* that proprietors of land at Chacachacare and Icacos should be prepared to destroy locusts in the event of their reaching Trinidad from the Venezuelan coast where they are now in large swarms. Poisoned bran mash can be obtained on application to the Director of Agriculture.

The Ceylon Department of Agriculture has issued an important Bulletin (No. 20) dealing with the effect of different intervals between successive tappings of Hevea rubber trees. Within limits, the yield per tapping increases as the time interval between tappings is increased. The whole subject dealt with is of much importance at the present time when strict attention is being given to economy in estate practice.

The balata produced in British Guiana during 1914-15 has far exceeded the output of any previous year, but the European War, says the Demerara *Daily Argosy*, retarded the selling of this article materially as large quantities are normally consumed in Germany. Though the price obtained at present is remunerative, nevertheless the fall in consumption has led to a reduction in the number of men employed for collecting.

The lessons in elementary agriculture arranged in Bulletin No. 258 of United States Department of Agriculture, for Alabama schools, are very suggestive and original. The lessons are outlined by monthly periods: each lesson has a definite subject, like soils or crops, and subsidiary to the subject is a topic such as crop rotation (under soils) and corn judging (under crops). This publication is well worth the attention of those engaged in agricultural education.

It is observed in the *Colonial Journal* that the occurrence of 'vomiting sickness' which is common in Jamaica at certain times, corresponds exactly with the main akee season, when other fruits and natural foods are relatively scarce. Last year the akee season continued longer than in previous years, and 'vomiting sickness' cases were reported in greater numbers than in the previous year and extended over a more prolonged period. This has been noticed for three or four years past.

In a previous issue of the *Agricultural News* it was not possible on the strength of available information to make any promising statements about tobacco cultivation in Ceylon. It appears from the *Tropical Agriculturist* for September 1915, however, that a very satisfactory 'Turkish' cigarette is being produced locally from Ceylon-grown tobacco. The entire Press are distinctly laudatory over samples exhibited at a recent exhibition, and it is announced that the Governor himself has pronounced the new cigarette as 'quite a good smoke'.

A literary production of some interest has been published in Cuba under the title of 'The New Agriculture', which consists essentially of a prize essay on the subject of a method of controlling or finding a cure for bud rot disease of coco-nuts. The writer maintains that this malady is caused through the inefficient working of the roots, and that this may be remedied by the mechanical introduction of water into the middle of the stem. These ideas do not appear to be in harmony with the best mycological work on the subject.

The Queen of Holland has presented the Governor of Surinam with 1,000 guilders to be utilized in assisting the Panama hat industry in that colony. The particular straw, says the *Port-of-Spain Gazette*, from which Panama hats are made, can be grown in Surinam, and some time ago a pamphlet was published by the Department of Agriculture in that colony showing how it could be economically used. It is stated further that Professor Harrison, of Demerara, on the occasion of his visit to Surinam some time ago, reported favourably on this project.

In the *Chamber of Commerce Journal* for October 1915, will be found conveniently summarized, the results of enquiries made by the West India Committee on the subject of the possibilities of an expansion of sugar-cane cultivation within the Empire. These results were published at length in recent issues of the *West India Committee Circular*. The situation in India and twelve of the leading tropical colonies is dealt with, and it would appear that in some places, particularly British Guiana and British East Africa, there is very considerable scope for large extensions.

A remarkable variety of the common papaw is referred to in the Inventory of Seeds and Plants Imported by the Office of Foreign Seed and Plant Introduction of the United States Department of Agriculture for January 1 to March 31, 1913. The variety referred to comes from Merida, in Mexico. The fruits are described as being very large and fine flavoured. The trees produce when small and are very prolific; many trees not over 7 feet in height are bearing from fifteen to twenty enormous fruits and innumerable smaller ones. It is added that Chinese gardeners about Merida are securing most remarkable results with this fruit.

MONTSERRAT: REPORT ON THE AGRICULTURAL DEPARTMENT, 1914-15.

This report has just been issued. Amongst its most important features is the valuable work on the selection of cotton at the Experiment Station which is being continued, and an extension of which has been rendered possible by the action of the Montserrat Company, Limited, in placing one of their fields at the disposal of the Department for the purpose of raising pedigree seed for distribution to estates. The principal line of work in the year under review consisted in testing recognized good types of cotton from both St. Kitts and St. Vincent, alongside the best of the types in cultivation in Montserrat. The usual progeny row method of testing the yield was adopted, on land again loaned from Dagenham estate. The yields of each type grown, all the rows of which were duplicated excepting St. Kitts 205, and the report and valuation of the samples of lint given by the British Cotton Growing Association are recorded in a table contained in this section of the report. From this it appears that Dagenham Stirling No. 4, Douglass, St. Kitts new seed, and Heaton 9, represent the best cottons. In the opinion of the British Cotton Growing Association, these are better than average Nevis, but are not equal to average St. Kitts. In addition to finger tests, seven of the types grown were also submitted to spinning tests, which were carried out under the auspices of the Fine Cotton Spinners' and Doublers' Association of Manchester. From the report it would appear that, while the reports on the finger and spinning tests are not in absolute agreement, they permit the generalization to be made, that when the seeds of high priced cotton from St. Vincent and St. Kitts are grown in Montserrat, they regress to the mean of the values of the cotton already in cultivation there. In this connexion it might be added that, in view of the war, stability has been given to the cultivation of cotton by the guarantee of a minimum price by the Fine Spinners' and Doublers' Association of Manchester.

The general situation with regard to lime cultivation receives attention in a section specially devoted to this subject.

With regard to minor industries, attention may be directed to the production of bay oil, onions, ground nuts and Indian corn, all of which show signs of great development. In connexion with bay oil it is noteworthy that during the year this product has engaged the attention of experts in England. With the prospect of a Canadian market for part of the onion crop, the development of the cultivation on some of the estates in the centre of the island where subsidary crops are much needed, received attention. It was reported, however, that onions had been tried under these conditions, and that while they had given good returns, they quickly rotted. The experiments conducted at Harris' Station in the present season substantiated this conclusion, the results showing that it is inadvisable to attempt onion cultivation under conditions similar to those of the Experiment Station.

In view of the prospect of an extended cultivation with ground nuts in 1915, Mr. Robson suggests one or two points in connexion with the cultivation which deserve attention. Firstly, only a limited number of weedings can be given to the nuts before the haulms cover the ground, hence clean cultivation is necessary; secondly, where the area in cultivation is large, the curing of the nuts will need to be done in the field; after digging, the haulms with the nuts attached should be spread for a couple of days and exposed to the sun, then they should be stacked for another ten days before being picked off either by hand or by means of threshing machines. When the nuts are reaped by means of forks or pulled out by hand, a proportion of them become disengaged from the haulm and remain in the ground.

In view of possible development of pine-apple cultivation two shipments of this fruit were sent to Canada in 1914. On both shipments it was reported that the pines shipped green and carried in ordinary hold space arrived in very good condition, while those in the refrigerator did not turn out so well, being spotted and 'touched'. The report of the consignee in regard to future trade with Canada was to the effect that these Montserrat pines were not very symmetrical, and not so pleasing to the eye as the pines imported from Florida and California, though the flavour is excellent. It was advised that before shipping in large quantities, it would be as well to make another trial shipment of 20 crates, which should be large pines.

Owing to the altered position on the English market on account of the war of Sea Island cotton, which is the staple crop of the island, it appeared necessary for planters to turn their attention to new crops in view of the curtailment of the area in cotton. At a well attended meeting of planters held on September 19, 1914, the Imperial Commissioner of Agriculture summarized the position and mentioned the particular crops, the temporary substitution of which in place of cotton, might prove profitable. Foremost amongst these was corn (maize). This crop, it was pointed out, had several advantages. Amongst pea and bean crops, attention was drawn to the possibilities of the pigeon pea and the Lima bean, or as it is known locally, Jamaica bean (*Phaseolus lunatus*), both of which would find a market in England or elsewhere. There seems to be an opening also for a trade in Bengal beans, and enquiries have already been made for these at £7 per ton.

Perusal of the Report will make it evident that useful work continues to be done to advance agricultural matters in Montserrat, and, considering the unsettled state of affairs externally, the island's present position and future prospect would seem, on the whole, satisfactory.

Effect of Detasselling on Maize.—At a meeting of the Academy of Science at Paris in September, says *Nature*, a paper was read on the transmission, by seeds, of the effects of emasculation in maize stems. It has been shown that one effect of male castration in maize is to increase the amount of sugar in the stems. This has been carried out for four successive years, and it has now been proved that this increased proportion of sugar in the stems can be transmitted by the seed. It is interesting to speculate whether a similar treatment of the inflorescence might induce a similar change in the stem of the sugar-cane, which change, according to the principle established by the experiments of maize, one would expect to be transmitted.

PLANT DISEASES.

BURGUNDY MIXTURE AS A SUBSTITUTE FOR BORDEAUX MIXTURE.

Considerable difficulty is experienced in several of the West Indian islands in obtaining quicklime for the preparation of Bordeaux mixture, and in keeping it in good condition when it has been procured. This has resulted in the use of slaked, or partially slaked, lime for the purpose, with the result that an inferior mixture has been produced. Instead of resorting in this difficulty to expensive and unsatisfactory commercial preparations, it may be suggested that the use of Burgundy mixture, in which the lime is replaced by sodium carbonate (washing soda) offers an alternative that is likely to give excellent results.

According to experience covering a period of five years in the use of Burgundy as compared with Bordeaux mixture against potato blight, the Department of Agriculture for Ireland reports that the former gave better results in the yield of the sprayed plots, and possesses moreover, the following advantages even where good lime is available:—

1. The spraying mixture adheres longer to the foliage of the plants, and is not so readily washed off by rain.
2. The mixture is more easily prepared.
3. The nozzles of the machine are not so likely to become stopped up with grit or refuse material. If the mixture is carefully made there should be no sediment.

Dr. A. S. Horne has recently published in the Journal of the Royal Horticultural Society a formula for a Burgundy mixture which is rendered more adhesive by the addition of milk, and records very successful results from its use against leaf-curl disease of peaches. The proportions are as follows:—

Copper sulphate	9¾oz.
Washing soda	11oz.
Milk	¾pint.
Water	3galls.

The quantities do not need to be altered when the milk is omitted.

The Irish formula is given as

Copper sulphate	8lb.
Washing soda	10lb.
Water	40galls.

which may be remembered as 8-10-40. It differs slightly from the Wisley formula in the larger amount of soda, and with the quality of materials at the disposal of this Office it has been found slightly alkaline, and therefore presumably safe, while the latter was somewhat acid. The quality of the precipitate was equal in the two cases. For small quantities it can conveniently be approximately reduced to:—

Copper sulphate	6½oz.
Washing soda	8oz.
Water	2galls.

It is greatly improved by the addition of milk as in the Wisley formula.

It must be remembered that it is the Imperial gallon of 20 oz. to the pint, and not the American of 16 oz. that is indicated in these formulæ.

The solutions of copper sulphate and of soda are to be prepared separately as in making Bordeaux mixture, but the set of 3 barrels commonly used for the latter is not necessary. The copper sulphate solution must not come in contact with metal, so that the most convenient method is to have one large barrel which is to hold the prepared mixture, run in seven-eighths of the water, and suspend the copper sulphate in a piece of sacking near the surface of this until dissolved. If it is powdered it will of course dissolve more quickly. The soda is dissolved in the remaining one-eighth of the water (a pint from each gallon of the whole), an operation which may be carried out in a pail or kerosene tin. The copper sulphate solution is then to be stirred round and the soda solution steadily poured in. The resulting mixture is light blue in colour, and if well made is full of a flocculent precipitate which remains suspended in the water without any stirring. The colder the solutions are before mixing, the better the quality of the precipitate will be. The mixture should be used fresh, since the precipitate on standing becomes crystalline and heavy, and loses its adhesive powers.

The mixture may be tested with litmus paper, and more strong soda or copper sulphate solution added if necessary, until the mixture is neutral or slightly alkaline. Acidity is indicated by blue litmus turning red, alkalinity by red litmus turning blue, neutrality by neither change occurring.

The price of copper sulphate in Barbados is 15c. per lb.; washing soda is 4c. per lb. retail, but can be obtained in 100lb. kegs at 2½c. At the latter price the mixture would cost just over 3½c. per gallon.

W. N.

COCO-NUTS.

MANURIAL EXPERIMENTS AT NEVIS.

The following are the first year's results of a series of manurial experiments, conducted under the auspices of the Agricultural Department, with coco-nut palms about seven years old growing at Pinneys' estate in Nevis. The details of the work have been carried out by Mr. W. I. Howell, the Agricultural Instructor, and although they are only the first year's records, the results are interesting and suggestive, as is also the method of recording the different yields based on the difference between the number of nuts on the tree at the beginning and the end of the experiment. It is important to remember that the term 'nut' is employed to represent a fruit from the matured (dry) stage to the size of a 'select': say, 14 inches round the middle and 18 inches over the ends. Smaller nuts are not included in the meaning of the term:—

PLOT 1.

Number of nuts on the 28 trees at the beginning of experiment	830
Average number of nuts per tree	29·6

Received as manure:—

Nothing.

Number of nuts collected during the year	722
Average number per tree	25·7
Number of nuts left on trees at close of experiment	659
Average number per tree	23·6.

PLOT 2.

Number of nuts on 28 trees at beginning of experiment	981
Average number per tree	35·0

Received as manure:—

8 estate baskets of pen manure per tree.

Number of nuts collected during the year — —	827
Average number per tree — — —	29·5
Number of nuts left on trees at close of experiment	945
Average number per tree — — —	33·7

PLOT 3.

Number of nuts on 28 trees at beginning of experiment — — — —	697
Average number per tree — — — —	25·8

Received as manure:—

8 lb. tankage per tree (4 cwt. per acre).

Number of nuts collected during the year —	709
Average number per tree — — — —	26·2
Number of nuts left on trees at close of experiment	841
Average number per tree — — — —	31·1

PLOT 4.

Number of nuts on trees* at beginning of experiment	603
Average number per tree — — — —	24·1

Received as manure:—

8 lb. basic slag per tree (4 cwt. per acre).
4 lb. sulphate of potash per tree (2 cwt. per acre).

Number of nuts collected during the year — —	605
Average number per tree — — — —	24·9
Number of nuts left on trees at close of experiment	614
Average number per tree — — — —	24·5

*Only 25 bearing trees are in this plot, as 3 are very late supplies.

PLOT 5.

Number of nuts on trees* at beginning of experiment	570
Average number per tree — — — —	23·7

Received as manure:—

4 lb. sulphate of ammonia (2 cwt. per acre).

Number of nuts collected during the year — —	521
Average number per tree — — — —	21·7
Number of nuts left on trees at close of experiment	622
Average number per tree — — — —	25·9

*Only 24 bearing trees are in this plot, as 4 are late supplies.

PLOT 6.

Number of nuts on trees* at beginning of experiment	358
Average number per tree — — — —	13·7

Received as manure:—

4 lb. sulphate of ammonia per tree (2 cwt. per acre).
8 lb. basic slag " " " " "
4 lb. sulphate of potash " " " " "

Number of nuts collected during the year — —	651
Average number per tree — — — —	25·0
Number of nuts left on trees at close of experiment	852
Average number per tree — — — —	32·7

*Only 26 bearing trees are in this plot, as 2 are late supplies.

PLOT 7.

Number of nuts on trees* at beginning of experiment — — — — —	641
Average number per tree — — — —	23·7

Received as manure:—

8 lb. basic slag per tree (4 cwt. per acre).

Number of nuts collected during the year — —	539
Average number per tree — — — —	19·9
Number of nuts left on tree at close of experiment	689
Average number per tree — — — —	25·5

*Only 27 bearing trees are in the plot, as one is a late supply.

PLOT 8.

Number of nuts on trees* at beginning of experiment — — — — —	741
Average number per tree — — — —	28·5

Received as manure —

8 lb. cotton seed meal per tree (4 cwt. per acre).

Number of nuts collected during the year — —	692
Average number per tree — — — —	26·6
Number of nuts left on trees at the close of experiment — — — — —	852
Average number per tree — — — —	32·7

*Only 26 bearing trees are in the plot, as 2 are late supplies.

The following table is of interest in obtaining an insight into the progress of the experiment:—

Manure.	Nuts collected per tree.	Difference between number of nuts at end and at beginning of experiment.	Nuts produced during period of experiment.
1. No manure	29·6	−6·0	23·6
2. Pen manure	29·5	−1·3	28·2
3. Tankage	26·2	+5·3	31·5
4. Phosphate and potash	24·9	+0·4	25·3
5. Nitrogen	21·7	+2·2	23·9
6. Phosphate, potash and nitrogen.	25·0	+19 0	44·0
7. Phosphate	19·9	+1·8	21·7
8. Cotton seed meal	26·6	+4·2	30·8

While it would be a difficult matter to compare the results of one manure against another, it will be seen that the manures have all had a beneficial effect on the trees so far as number of nuts is concerned, for in none of the manured plots, except pen manure, is the average number of nuts per tree, at the close of the experiment, below what it was when the experiment was started. The case is otherwise with the no-manure plot.

During the past two years it was observed that the individual tree is producing a smaller number of nuts each year, and it would appear that manure would maintain the yield, and that manuring is both desirable and necessary.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, October 19, 1915.

ARROWROOT—2¼*d.* to 2 5/16*d.*
BALATA—Sheet 2*s.* 4¾*d.*; block 1*s.* 8½*d.*
BEESWAX—No quotations.
CACAO—Trinidad, 84/6 to 86/- per cwt.; Grenada, 79/6 to 80/6-; Jamaica, 70/ to 84/6.
COFFEE—Jamaica, 43/-
COPRA—£25 15*s.* to £26 per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 14*d.* to 16*d.*
FRUIT—No quotations.
FUSTIC—No quotations.
GINGER—Jamaica, 55/- to 65/-.
ISINGLASS—No quotations.
HONEY—No quotations.
LIME JUICE—Raw, 3/; concentrated, £30; Otto of limes (hand-pressed), no quotations.
LOGWOOD—No quotations.
MACE—6*d.* to 2/4*d.*
NUTMEGS—4¼*d.* to 6½*d.*
PIMENTO—2*d.* to 2 3/16*d.*
RUBBER—Para, fine hard, 2/5⅜; fine soft, 2/5¼; Castilloa, no quotations.
RUM—Jamaica, 4/2 to 4/9

New York.—Messrs. GILLESPIE BROS. & Co., November 5, 1915.

CACAO—Caracas, 20½c. to 21c.; Grenada, 19½c. to 20c.; Trinidad, 21c. to 21¼c.; Jamaica, 18¼c. to 18¾c.
COCO-NUTS—Jamaica and Trinidad selects, $31·00 to $33·00; culls, $21·00 to $22·00.
COFFEE—Jamaica, 7¾c. to 12c. per lb.
GINGER—13¾c. to 16c. per lb.
GOAT SKINS—Jamaica, 44c.; Antigua and Barbados, 42c. to 44c.; St. Thomas and St. Kitts, 40c. to 42c. per lb.
GRAPE FRUIT—Jamaica, $2·25 to $3·50.
LIMES—$4·50 to $6·00.
MACE—34c. to 45c. per lb.
NUTMEGS—11c. to 11½c.
ORANGES—Jamaica, $1·50 to $3·25.
PIMENTO—3¾c. per lb.
SUGAR—Centrifugals, 96°, 4·39c.; Muscovados, 89°, 3·77c.; Molasses, 89°, 3·61c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., November 15, 1915.

CACAO—Venezuelan, $21·00 to $21·50; Trinidad, $21·00 to $22·00.
COCO-NUT OIL—86c. per Imperial gallon.
COFFEE—Venezuelan, 11c. to 13c. per lb.
COPRA—$5·00 to per 100 lb.
DHAL—$6 25.
ONIONS—$4·00 to $4·50 per 100 lb.
PEAS, SPLIT—$9·00 per bag.
POTATOES—English $2·00 to $2·25 per 100 lb.
RICE—Yellow, $5·80 to $6·25; White, $6·25 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., October 30, 1915; T. S. GARRAWAY & Co., November 2, 1915.

ARROWROOT—$4·50 to $4·60 per 100 lb.
CACAO—$15·00 to $16·00 per 100 lb.
COCO-NUTS—$20·00 husked nuts.
HAY—$1·70 to $1·90 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $85·00 to $95·00 per ton.
MOLASSES—No quotations.
ONIONS—$7·00 to $10·00 per 190 lb.
PEAS, SPLIT—$10·00 to $12·50 per 210 lb.; Canada, $5·40 per 120 lb.
POTATOES—Nova Scotia, $4·87 to $5·00 per 160 lb.
RICE—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—Muscovado centrifugals, $3·60 to $4·25.

British Guiana.—Messrs. WIETING & RICHTER, November 13, 1915; Messrs. SANDBACH, PARKER & Co., November 12, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	$9·50
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	15c. per lb.	23c. per lb.
CASSAVA—	$1·20	——
CASSAVA STARCH—	$10 to $11	——
COCO-NUTS—	$10 to $15 per M.	$18 per M.
COFFEE—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	——	10c. per lb.
DHAL—	$6·00	$6·00 to $6·25
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	7c.
PEAS—Split	$12·00 to $12·50	$12·00 per bag. (210 lb.)
Marseilles	——	——
PLANTAINS—	16c. to 40c.	——
POTATOES—Nova Scotia	$4·00 to $4·25	$5·00
Lisbon	——	——
POTATOES--Sweet, B'bados	$1·68	——
RICE—Ballam	No quotation	——
Creole	$5·25 to $5·50	$5·50
TANNIAS—	$2·64	——
YAMS—White	$2·88	——
Buck	$3·12	——
SUGAR—Dark crystals	$3·50 to $3·70	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——

AGRICULTURAL NEWS.

A FORTNIGHTLY REVIEW

OF THE

IMPERIAL DEPARTMENT OF AGRICULTURE FOR THE WEST INDIES.

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SCIENCE AND THE PRESS.

NEWSPAPERS are supposed to be the educators of public opinion, but more often than not they simply cater for the popular tastes and make little effort to mould public opinion in the ways of light and wisdom. Even the best of them have their own axes to grind, and, fettered by political prejudice or overcome by the modern lust for sensation they exert an influence which is not recognized as legitimate in the realms of science.

As a subject of popular interest science labours under the disadvantage that it is largely impersonal. It is lacking in humanistic qualities and for that amongst other reasons the daily Press is afraid to touch it. In the newspapers everything centres around individuals, or rather around personalities, and as it is impossible to give such a setting to scientific subjects they are severely ignored. It is true that from time to time articles involving scientific ideas do appear, but in these cases it is only because the essential conditions of presentation are satisfied. A short time ago an article appeared in a leading London paper under the following headlines:—

FERTILIZED PEAT.

PROFESSOR BOTTOMLEY AND A GERMAN.

A National Committee.

Here it will be seen the two conditions of sensation (or novelty) and personality are satisfied; and quite irrespective of the relative worth of the recorded information in the light of impartial scientific scrutiny, the paper proceeded to hold forth at length, involving as many extra personalities as possible, on the revolution of English farming on account of the new discovery. While the special subject under notice is of interest and possibly of some considerable importance, it is not even on a par with hundreds of other discoveries, and it simply shows that the Press is deficient in the matter of possessing members on its staff who are in a position to gauge the relative worth and importance of scientific work. This is rendered evident in every case. We have been told that on one occasion a great London newspaper having heard of the John Innes Horticultural Research Institute, which is situated at Merton, in Surrey,

decided to send down a reporter. Having been duly shown some of the Mendelian results obtained with plants and poultry by the Director, Professor Bateson, the reporter, greatly impressed, returned to his office, and the next day submitted a proof with the following headline:—

THE WIZARD OF MERTON

which, had it been passed, would have produced an impression of quackery which to a man of science would scarcely be short of libel, even though it had been invented with the best of journalistic intention.

At the present time Great Britain is involved in war—in a struggle which depends as much upon science and machinery as upon men. One would have expected that the attitude of the Press in relation to science might under these conditions have undergone some change. Apart from a general flutter concerning the desirabi'ity of mobilizing science—which was only started by *outside* initiative, namely, by letters sent to *The Times*, notably by Mr. H. G. Wells—the Press has done nothing even to make the public realize the compelling earnestness of science. We quite recognize the difficulty of dealing in a popular style with technical subjects in the absence of any special knowledge on the part of the reporter, but in such a case as Professor Fleming's lecture on Science in the War and After the War recently delivered to a public audience at University College, London, there would seem to be no excuse on that ground for neglecting to report its salient points in the newspapers. This lecture has been printed in full in *Nature* and also in the *Journal of the Royal Society of Arts*. While this is an acknowledgment of its value, and will suffice to bring it to the notice of scientific and technical men, it misses the wider public: It is impossible to get the ear of the wider public except through the daily Press, and it may be supposed that the Press will do nothing until the public shows a definite desire to offer it. This brings us to the subject of education, which owing to limitation of space cannot be discussed here at any length. Suffice it to say that the teaching of science in schools requires re-modelling, that an *appreciation* of science rather than a *knowledge* of science should be taught first, and this we may suppose could be best achieved by devoting greater attention to the historical side of science. In other words, we must descend to the level of those we criticise, but in a legitimate way, and teach our children science as it centres around the lives and personalities of Nature's greatest exponents.

* * * *

Since the above was written a copy of *Nature* for November 4 has been received. This contains an editorial headed Science and Nescience, containing ideas associated with those expressed above. In this article attention is called to the national characteristic, in Great Britain, of indifference to scientific plans of action, whether pertaining to operations during war or of industry in times of peace. This is largely responsible for the archaic system still in vogue whereby men are selected for administrative posts in the national service, irrespective of sound technical knowledge.

The article then deals with the existing want of sympathy and understanding between science and literature. Writers in the newspapers and periodicals when they do refer to scientific work rarely do so with accuracy and caution. Either terms are wrongly used, or a matter of common knowledge among men of science is regarded as a remarkable discovery, or sensational claims are presented to the public as if they were established truths, though they await confirmation from the scientific world, and are mostly unworthy of serious consideration.

In regard to national education *Nature* says: 'It is time to understand that no man can now be considered to have received a liberal education unless he has some acquaintance with the principles and methods of science and that works of Pasteur and Faraday should be as familiar to all as those of Victor Hugo and Tennyson. The training which ends in literary culture without science is just as incomplete as that which promotes scientific knowledge without the power of clear expression.'

With special reference to the matter of expression *Nature* points out that it is less easy to clothe the results of science in pleasing language than ideas of art and of the imagination. This is quite true, and, in our opinion, it points to what we have expressed at the end of the first part of this discussion—that education wants re-modelling to make people appreciate scientific knowledge because it is knowledge, and knowledge obtained through the highest of human agencies—the grey matter of the brain.

THE PROSPECTS OF SPONGE CULTIVATION.

In the current issue of the *West Indian Bulletin* (Vol. XV, No. 2) is a paper by Mr. W. R. Dunlop, on a method of sponge cultivation from cuttings, together with notes on other possible marine industries that might be developed in the Lesser Antilles.

The introduction to this paper deals with the circumstances which appear to justify experiments with sponge cultivation around certain islands like Antigua, Barbuda and the Grenadines, where the conditions are seemingly suitable. The chief circumstance lies in the financial success that has attended the rearing of sponges from cuttings in the Caicos Islands, near Jamaica, together with the results of earlier experiments in Florida.

Preliminary to describing the method referred to above, an account is given of the nature of the living sponge, also the requisites of a commercial sponge, and the different groups at present on the market, with special reference to the West Indies. A note is included on the native sponges of the Lesser Antilles. This indicates that material for planting must be imported. Although sponges are to a remarkable extent creatures of environment and tend, when imported, to approach the native sponges in quality, there is evidence which indicates that this may not occur in selected localities in the Lesser Antilles.

The method of propagating sponges from cuttings is briefly described with reference to the following points: seed sponges, cuttings, attachments, planting, rate of growth, harvesting, curing, and marketing. The information is based principally on work done in Florida, but certain new economies effected in the Caicos are alluded to.

The financial aspects of the industry in Florida and the Caicos are discussed. It is shown that if the correct environment is obtained, the industry is a very remunerative one.

Following the information relative to sponges are notes on other shallow-water fisheries which might be developed. These include lobster canning, the raising of pearl oysters and turtles, the collection of sea-eggs, edible oysters, conch shells, and sea-cucumbers (for bêche-de-mer).

Some of these industries have been already established in certain restricted areas, and might be greatly extended. In the creeks around the Caicos Islands some of these industries are profitably combined with the rearing of sponges.

In conclusion, it is believed that there are good prospects before efforts to utilize the shallow-water resources of the Lesser Antilles. The economic importance of such a line of development is obvious.

In connexion with the above, a letter received from Messrs. Knight & Co., of Barbados, is of interest. This states that Mediterranean sponges have for years been getting dearer, and that there are indications of a shortage this season in the Florida and Bahamas supplies. Messrs. Knight conclude: 'If, therefore, you have in mind the tapping of any other source of supply, or contemplate establishing a fresh sponge fishery, it will be welcome news to traders in sponges and users alike.'

In concluding this article, it may be noted that since the paper referred to above was published, the 1914-15 Report on the Bahamas has been received. This states that a large company has been formed in Florida (alleged capital of $1,250,000) for the cultivation of sponges from cuttings, and that the Bahamas Marine Products Board view this enterprise with alarm as it threatens their natural sponge industry which is, of course, more speculative than careful cultivation would be. It is expected that a trial of the new method will be made in the Bahamas. In the meantime something might also be done in the Lesser Antilles, for it might be found—it almost certainly would be found—that sponges could be produced more cheaply off the smaller islands of the Lesser Antilles than in the Keys of Florida.

EFFECT OF EXCESSIVE RAINFALL ON CROPS IN ST. LUCIA.

The rainfall in St. Lucia, during the last six months, has been excessive throughout the island, so that a few observations concerning the condition of the staple crops may be of interest.

The following notes on the subject have been received from Mr. A. J. Brooks, Agricultural Superintendent, St. Lucia:—

At the Botanic Gardens, Castries, 71·05 inches of rain fell during the period, this being 30·76 inches in excess of the fall for the same period the year previous. At Réunion 44·98 inches were recorded, this being 13·53 inches in excess of last year.

The effect on the lime crop has been to reduce the acidity of the fruit. This was at once felt by lime planters, and complaints were received from several sources to the effect that although the recorded number of barrels of fruit exceeded the amount for the same period during the last crop, yet the actual output of concentrated juice was lower even than last year.

The reduced acidity does not entirely account for the great differences experienced. The fruit, although possessing a lower acid content, is also much coarser than usual. Instead of the usual thin-skinned fruit, the rind is much thicker this season, and the fruit not so spherical; it takes more after the lemon, the nipple being in most cases abnormally developed for the lime. Being larger, a barrel contains fewer fruits.

At the Government Lime Juice Factory the records show that this season it is taking 51·8 barrels of fruit to produce a 42-gallon cask of concentrated juice of the usual strength, i.e., 107 oz. per gallon, whereas last year it required but 48·6 barrels.

This is a difference of 3·2 barrels and represents at the present factory prices a net monetary loss of 12*s.* per cask of 42 gallons concentrated juice on last season's results. This loss is again increased by the extra labour entailed in handling, and by the additional fuel required for excessive evaporation.

This crop in the usually dry districts of the island has greatly benefited by the heavy rainfall, and it speaks well for the way in which the drainage systems of the heavy soils in the large and more humid valleys have been laid out that no damage to the crop has been experienced.

A fine stand of cane is to be seen throughout the island, and given a good ripening season a heavy crop should be harvested.

The cacao crop although somewhat late, still shows great promise, and no increase in 'black pod' or other fungoid diseases has been reported.

The few acres of Sea Island cotton at Réunion have been entirely ruined by the continuous rains during the ripening period. Cotton is by far too precarious a crop for the climate of St. Lucia, and it is fortunate that the few acres at the Experiment Stations should be the only area under cotton cultivation in the island.

The older plantations of coco-nuts show no ill effects of the excessive rainfall, but in some localities the recently planted areas are feeling it, as is shown by the yellowish leaves.

SUGAR INDUSTRY.

MUSCOVADO WORKS AND CENTRAL FACTORIES COMPARED.

In the review of the work done during ten years at Gunthorpes Sugar Factory, Antigua, to which reference was made in the last issue of the *Agricultural News*, it was shown that during this period 50,474 tons of 96° sugar were made from 477,668 tons of cane, that is, 1 ton of sugar was equivalent to 9·46 tons of cane.

It will be interesting to consider what would have been the experience had these canes been dealt with in the muscovado factories formerly in existence, and what difference the manufacture of the sugar in a modern factory has made to the general output of sugar from the island. The data are available to enable the comparison to be made.

It has been shown that the work of the ordinary three-roller mills, such as are in use in the muscovado factories of Antigua, is such that the megass coming from a mill doing fairly good work, contains about 180 parts of juice for each 100 parts of fibre, while, from a mill doing indifferent work, the amount of juice rises to 200 parts for each 100 of fibre.

Information is available, as given in the following table, showing the composition of the canes dealt with in each of the ten years and also the sugar content of the juice from the first mill of the factory. This juice would be very similar to that expressed by the ordinary three-roller mill.

Table I.

Year.	Fibre in cane per cent.	Sucrose in cane per cent.	Sucrose in first mill juice per cent.
1905	15·1	15·3	19·7
1906	15·2	14·1	18·3
1907	15·1	14·4	18·5
1908	15·2	14·3	18·8
1909	15·6	14·2	18·6
1910	15·9	14·7	19·1
1911	15·8	14·1	18·5
1912	17·5	14·2	19·0
1913	17·7	12·9	17·7
1914	16·6	13·5	18·0

The quantity of juice that three-roller mills, both indifferent and fair, would be capable of extracting from canes of the character here indicated, is given for each year in the next table.

It will be noticed that in the first four years under consideration, the quantity of fibre in the canes was slightly over 15 per cent., but that after this it tends to rise, until in the last three years it ranges from 16·6 to 17·7. It is to be remembered that these figures represent the average of each season's work; the maximum fibre content in each year has, therefore, been considerably in excess of the figures now given.

The effect of the fibre content on the work of small mills is well brought out in the table. In the first four years it is shown that the mills would extract from 50½ to 53½ per cent. of juice, according as the mill might be classed as good or poor: in 1913, however, it is shown that the mills would only be expected to give from about 42 per cent. to 45½ per cent. of juice.

Table showing the quantity of juice capable of extraction by three-roller mills.

Table II.

Year.	GOOD MILL.		POOR MILL.	
	Juice per cent. canes.	Imperial gallons per ton cane.	Juice per cent. canes.	Imperial gallons per ton cane.
1905	53·5	110·4	50·5	104·2
1906	53·1	110·2	50·1	104·0
1907	53·5	110·8	50·5	104·6
1908	53·1	110·0	50·1	101·4
1909	51·9	107·5	48·8	101·1
1910	51·1	105·6	47·9	99·0
1911	51·4	106·3	48·2	99·7
1912	46·1	95·2	42·6	87·9
1913	45·4	94·2	41·9	87·0
1914	48·9	101·5	45·6	94·6

If these facts are considered in terms of Imperial gallons of juice per ton of cane, it follows that in the first four years a poor mill would have given about 104 gallons of juice per ton of cane, and a good one about 110 to 111 gallons. In the year 1913, a poor mill would have given about 87 gallons, and a good one about 94. Those accustomed to the work of muscovado factories will fully appreciate the significance of these figures.

We may now consider what quantity of muscovado sugar would be expected as the yield from these canes, and the quantity of cane it would have taken to make a ton of muscovado sugar. In calculating the following results, it has been assumed that 100 lb. of sugar in the juice will yield 80 lb. of dry muscovado sugar.

Table III.

Year.	GOOD MILL.		POOR MILL.	
	Sugar per 100 lb. cane.	Tons cane per ton sugar.	Sugar per 100 lb. cane.	Tons cane per ton sugar.
1905	8·43	11·86	7·94	12·56
1906	7·79	12·85	7·36	13·62
1907	7·94	12·62	7·50	13·31
1908	7·96	12·55	7·51	13·31
1909	7·72	12·96	7·19	13·92
1910	7·81	12·80	7·33	13·64
1911	7·60	13·15	7·13	14·03
1912	7·01	14·27	6·48	15·44
1913	6·43	15·55	5·93	16·85
1914	7·03	14·22	6·56	15·25

From the above it is seen that while in the earlier years it would have been possible to obtain about 8 per cent. of muscovado sugar from a good mill, and about 7½ from a poor one, in 1913, a good mill would have given only about 7 per cent., and a poor one about 6½. If the facts are considered on the basis of the tons of cane taken to make a ton of sugar, we find that a good mill in the earlier years would have taken about 12½

tons, and a poor one about 13½; while in 1913, the good mill would have required some 15½, and the poor one over 16¾ tons of cane per ton of sugar. It is highly probable that the experience of those who were making muscovado sugar in Antigua during this period will fully confirm these calculations.

The effect of the change in the method of manufacture may next be considered. For this purpose, we may take the mean between good mills and poor ones as fairly representing the average conditions in the island. On this basis the following figures are calculated.

Table IV.

Year.	Average tons cane per ton muscovado sugar.	Tons cane crushed.	Estimated tons muscovado sugar.	Tons 96° sugar made by factory.	Difference tons.
1905	12·21	15,681	1,284	1,634	350
1906	13·23	24,676	1,872	2,349	477
1907	12·96	40,782	3,147	4,231	1,084
1908	12·93	43,060	3,330	4,696	1,366
1909	13·44	37,284	2,774	3,995	1,221
1910	13·22	48,319	3,655	5,390	1,735
1911	13·59	55,117	4,056	5,472	1,416
1912	14·85	59,371	3,998	6,239	2,241
1913	16·20	70,348	4,343	7,337	2,994
1914	14·73	83,030	5,637	9,131	3,494
		477,668	34,096	50,474	16,378

The gain in tons of sugar exported in each year is clearly seen, while in the aggregate for the ten years, the gain has been 16,378 tons. It is interesting to note incidentally, that the average tonnage of cane estimated to be taken to make a ton of muscovado sugar during this period works out at 14 tons.

This gain in output constitutes a large accretion to the wealth of the island. It must not be assumed, however, that this gain is one which goes entirely to the estates producing the canes; a considerable part of it is absorbed in providing and working the factory. In addition to this there is some off-set in the diminished value of the molasses produced. Still, taking all the circumstances into consideration, it is evident that the wealth of the island is materially increased by the operation of the factory.

DEPARTMENT NEWS

The Imperial Commissioner of Agriculture returned to Barbados by the C.R.M.S. 'Chignecto', on December 15, from St. Vincent and Grenada, after having paid an official visit to the former Colony extending to eleven days, and three days in the latter.

Mr. H. A. Ballou, M.Sc., Entomologist, and Mr. W. Nowell, D. I. C., Mycologist to the Department, are expected to leave Barbados on official visits to St. Vincent on December 29.

GROUND NUTS FOR EXPORT.

In April last, samples of three varieties of ground nuts were forwarded in a shelled condition from Montserrat to the Imperial Institute for report and valuation. The report has recently been received. In this it is stated that the samples of the varieties sent, namely, Virginia Running, Gambia, and Rufisque, consisted of kernels of fair appearance and good flavour. The average weight of one kernel varied from 0·89 gram, in the case of sample 1, to 0·54 gram, in the case of sample 3. As regards the percentage of oil, this likewise varied from 45·6 per cent. in sample 1 to 47·6 per cent. in sample 2, sample 3 being intermediate in respect of oil content.

Coming to commercial valuation, the report goes on to say, 'The samples were submitted for valuation to merchants in London, who reported that sample No. I consisted of bold kernels of good marketable quality, similar in appearance to Chinese kernels and suitable for the English edible trade, whilst No. 2 consisted of smaller kernels than No. 1, but was of good marketable quality and suitable for crushing. The kernels of sample No. 3 were described as of about the same size as No. 2 but of mixed appearance; they were, however, stated to be of fair quality and suitable for crushing.'

The firm valued the three samples as follows:—

No. 1 £15 10*s.* per ton c.i.f d/w London and Marseilles
No. 8 £14 10*s.* „ „ „ „ Marseilles
No. 3 £14 „ „ „ „ „

The Report continues:—

'The importation of shelled ground nuts into the United Kingdom for crushing purposes has not been taken up on a large scale hitherto, but there is some evidence that it is likely to increase, and there seems to be no reason why kernels of the quality of the present samples should not eventually be exported from Montserrat to the United Kingdom, and to France. The latter country has always been the chief market for this product.

'The ground nut market is, however, in a very difficult position at present owing to the war, and the present would not be opportune for largely extending the cultivation of ground nuts in the island.'

Commenting on the above, Mr. Robson, Curator of the Botanic Station, Montserrat, points out that the prices quoted would hardly be remunerative to growers in Montserrat. It appears that there is more hope for developing a ground nut trade with Canada and with the other West Indian islands like Trinidad than with the United Kingdom. Whatever the conditions as regards the market are at present, there is no doubt that it is desirable to maintain interest in Montserrat in the cultivation of ground nuts, for in the future it is likely that a good export trade may eventually be established.

Some useful facts concerning Indian corn are given in the *Journal of the Jamaica Agricultural Society* for October 1915. It is stated that ordinary cultivation gives 25 bushels per acre, whereas on fair land with good cultivation it should not be less than 50 bushels per acre. In the Clarendon competition the best yield (99¼ bushels per acre) resulted from planting 5 feet by 4 feet, with from 4 to 6 grains in the hole. In regard to depth of planting, it is stated that as a general rule, if corn grains are covered with 1 inch depth of soil, growth is quicker and stronger than if they are covered deeper. A great deal, of course, depends on the conditions of moisture at the time of planting.

WEST INDIAN COTTON.

Messrs. Wolstenholme and Holland, of Liverpool, write as follows, under date November 15, with reference to the sales of West Indian Sea Island cotton:—

A good business has been done in West Indian Sea Island cotton since our last report; about 700 bales have been sold at firm to hardening prices. The sales include St. Vincent, ordinary quality, 15*d.* to 20*d.*, superfine quality 22*d.* to 28*d.*, Montserrat 15*d.* to 15½*d.*, Antigua 13*d.* to 15*d.*, Barbados 15*d.*, Nevis 14½*d.* to 15*d.*, St. Kitts 14½*d.* to 15½*d.*, Jamaica and St. Lucia 10*d.* to 11*d.*

The stock is now reduced to about 100 bales and the demand is improving.

The Report of Messrs. Henry W. Frost & Co., on Sea Island cotton in the Southern States, for the week ending November 27, is as follows:—

ISLANDS. There was a good demand throughout the week for the old bags grading Fine to Extra Fine, taking all the offerings at our quotations, the buying being on account of the Northern Mills.

There had been little demand for Fine for several weeks; consequently the stock of this grade had accumulated, which admitted of the large sales, which consisted principally of this quality.

The market closes very steady with a continuance of the demand taking the daily offerings.

There is some little demand for Planters' crop lots, but at prices below the views of Factors.

We quote, viz.:

Extra Fine	27c. to 28c.	= 17*d.*-17½*d.*	c.i.f. & 5 per cent.
Fully Fine	26c.	= 16½*d.*	,, ,, ,, ,,
Fine	25c.	= 16*d.*	,, ,, ,, ,,

FLORIDAS AND GEORGIAS. There has been no change in the market this week. The offerings were all taken at our last quotations. The demand is chiefly for Choice and Extra Choice, which Factors refuse to sell except in conjunction with Fancy, for which there is but a limited demand, and of which the offerings chiefly consist. To secure the lower grades, therefore, Fancy has been taken along with them. The market closed very steady, with no disposition on the part of Factors to lower their prices, but rather to advance them.

The demand is for Northern Mills, and the exports from Savannah and Jacksonville this week were again large, 2,978 bales.

We quote, viz.:

Fancy	25½c. = 26½c.,	landed.
Extra Choice	24½c. = 25½c.,	,,
Choice	23½c. = 24½c.,	,,

The exports from Savannah for the week were to Northern Mills 498 bales, Southern Mills 25 bales, and from Jacksonville to Northern Mills 2,455 bales.

The U.S Census Bureau reports cotton ginned to November 14, as follows:

South Carolina	2,243 bales		
Georgia	44,791 ,,	Making a total of	69,477 bales
Florida	22,443 ,,		

against last year 53,875 bales. Total crop 78,857 bales.

,,	1913	52,679 ,,	,,	85,544	,,
,,	1912	41,321 ,,	,,	66,169	,,
,,	1911	71,204 ,,	,,	122,512	,,

ITALIAN CITRUS PRICES IN 1914.

The following review of the Catania and Sicilian market for 1914, taken from the *Perfumery and Essential Oil Record* for October 1915, will interest lime and orange growers in the West Indies:—

It is interesting to note that the prices of essential oils, not only because of the war, but from natural causes, had fallen to a point below any in the preceding ten years. During these ten years (from 1905) the prices of essential oils have steadily advanced, reaching the maximum quotations in 1913.

The following table indicates the price scale per pound f.o.b. Messina, during the period:—

Period.	Lemon oil.	Orange oil.	Bergamot oil.
Opened 1905	0·548	1·521	2·373
Average, 1905 to 1909	0·852	1·744	2·859
Average, 1910 to 1914	1·724	1·967	4·988
Closed 1914	0·831	1·318	2·514

From 1905 until 1913 the oil obtained was only sufficient to supply the demand. This accounts for the inability to accumulate stocks and the steady increase in quotations. With better crops in 1913, quotations began to fall, and not only was the demand supplied but stocks began to accumulate.

Lemon oil was sold in Sicily at $2·312 per lb. at the beginning of 1914. The accumulated stock from the preceding year began immediately to depress the market, so that even during January, quotations fell to $2·008, and in February to $1·825. Local speculation at the end of February forced a rise to $2·312 but this was only temporary, as quotations in March again fell to $2·068. At the beginning of April it was known that the Californian crops were good, so that little profit was to be expected from the export of fresh fruit to the United States. Great quantities of lemons, which would otherwise have been exported, were therefore used in the manufacture of essential oil and citrate of lime. The manufacturers of the latter obtained good prices, as the Camera Agrumaria of Sicily continued to advance the price of citrate of lime.

These combined circumstances caused a large production of lemon oil, which not only met the demand but permitted the accumulation of considerable stocks. This latter fact alone would have occasioned a depreciation in prices, but the outbreak of the European War created a further depression. The price of this oil fluctuated between $2·068 and $1·582. The effect of the war was immediately shown in the months of August and September, when the price fell to $0·973; and when it became certain that the new lemon crop would be good, the price dropped still lower, closing the year at $0·831.

The year 1914 opened with quotations of sweet orange oil at $2·677, but prices gradually declined, until at the end of May sweet orange oil was quoted at $2·433 per lb. From June to September a marked drop was noticed, quotations having reached $1·703. With the beginning of the manufacture of the new crop oil buyers were only offering $1·217, which low figure continued until the end of the year (October to December). As profits were insufficient to the manufacturers, only a small quantity of orange oil has been produced from the new crop of 1914.

Another important factor in the depression of the market is the increasing production of sweet orange oil in Jamaica,

the amount produced at present being nearly sufficient to meet the American and British demands.

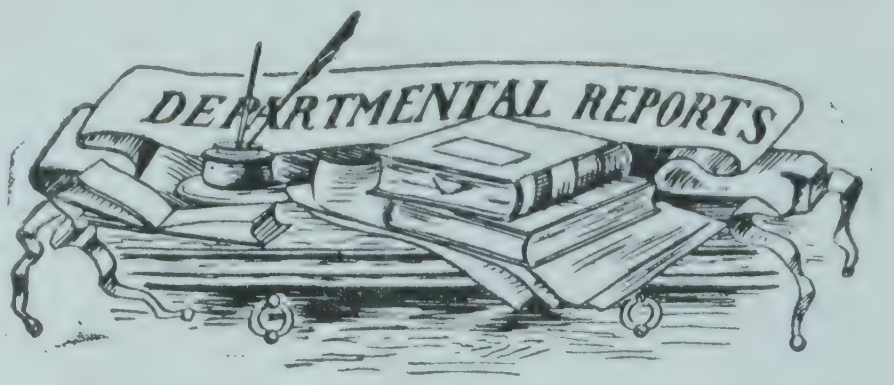
The production of the citrate of lime during 1914 was about 6,707 tons, this being somewhat larger than was at first anticipated, because, as has been previously stated, the export of the summer lemons was considerably restricted by the war, and the unexported fruit was converted into by-products.

DURATION OF LIFE OF THE SISAL HEMP PLANT.

A useful article on the cultivation of sisal hemp has been published in the *Bulletin of the Imperial Institute* (Vol. XIII, No. 3). One of the most interesting features of this article are the observations on the duration of the life of the plant, which we reproduce below. It will be remembered by our readers that this is largely bound up in the question of poling, and in the course of referring to this point in the following note, it is difficult to understand why no attention is given to the relationship between lime in the soil and poling established by Mr. Cousins in Jamaica:—

As has been already stated, the duration of life is determined by the production of the pole or inflorescence. In Mexico the plants are said to live for fifteen, or sometimes even twenty-five years before poling, whilst in more tropical countries they live a much shorter period, the average length of life in East Africa being only about six years. In general, the duration of the plant appears to be largely dependent on condition of soil and climate. It has been asserted that the life may be prolonged by cutting out the pole as soon as it appears above the leaves, the plant being thus rendered available for fibre for nearly a year longer than it would be otherwise; but experiments which have been conducted in German East Africa do not support this view. The early poling of sisal plants in East Africa has been much discussed, and has been regarded by some planters as a great disadvantage. It appears, however, that the comparatively short life is due to the fact that there are two growing seasons in that country, and growth is checked twice a year, whereas in less tropical countries there is only one growing season per annum. Thus it is evident that the plant in East Africa lives through approximately the same number of growing seasons as it does in other countries, but only about half as many years. Moreover, the number of leaves produced per plant (on the average about 200) is roughly the same in each case, and hence the comparatively brief duration of life is rather an advantage than otherwise, as the total crop of the plant is produced in a relatively shorter time.

Since the plants in a sisal plantation do not all pole at the same time, the work can be carried on continuously by the intercalary method sometimes adopted in German East Africa. As the plant lives for only about six years, cutting can only be carried on for two or three years before it dies. New plants are therefore continually inserted between the old ones, so that when one plant dies another is ready for cutting, and the work of the plantation can proceed without interruption. Some planters, however, do not approve of this method, but prefer to let all the plants in a plantation pole and die, and then allow the land to lie fallow for a year or more before replanting.



BARBADOS: REPORT ON THE SUGAR-CANE EXPERIMENTS FOR THE SEASON 1913-15.

Professor d'Albuquerque and Mr. J. R. Bovell have recently published their results on experimental work with sugar-cane in Barbados for the period 1913-15. As in former years, the report is divided into three sections.

In regard to Part 2, it is stated that the results obtained from the general series of manurial trials, which are repeated each year, were seriously interfered with during the season under review by a new factor, namely, the grub of the root borer. As this subject has been dealt with under Insect Notes in the last issue of the *Agricultural News*, it is unnecessary here to do more than repeat, that the damage was of such an extent as to render it impossible to draw any definite conclusions as to the respective influence of the different fertilizers.

In an additional series, planned to show the relative values of nitrate of soda, sulphate of ammonia, nitrate of ammonia, calcium cyanamide, and nitrate of lime, the disturbing factor referred to above was apparently absent, and the conclusions are drawn that, under the conditions of this particular season, nitrate of lime and nitrolim give the best results. These trials, it should be mentioned, were conducted in duplicate, and the above inference is based upon the means. An examination of the figures, however, shows us that one of the nitrate of soda plots gave 50 per cent. more sucrose than the other, and the highest yield but one of the whole series. The 'probable error' must therefore be high, and the conclusions correspondingly doubtful.

Turning to Part 3 of the report, which deals with the work of raising new varieties, we learn that in 1913 a total of 5,865 seedlings were obtained. Of these there were 1,073 selfed seedlings. and 384 natural hybrids. Of the 5,865, a first selection of 2,102 were planted at Waterford estate, and during the reaping season of 1915, 341 were cut and analysed, and of these 101 were considered worthy of attention. This, it will be realized, is work of very high value and importance, and work which is of great benefit to other cane-growing colonies as well as Barbados itself.

Tables are given in the Report to show in detail the composition and yields of the more important varieties. It is not the custom to recommend seedlings for trial until the average results of five years have been obtained, but at the present time there are three varieties which planters may try tentatively on their estates; these are Ba. 6032, Ba. 7924, and B.H. 10 (12). The first mentioned variety gave this season, as the average of fifteen plots on nine estates, 1,334 lb. of saccharose per acre more than B.6450, and 3,061 lb. of sucrose more than White Transparent. Ba. 7924 gave 2,602 lb. more than B.6450, and 3,202 lb. more than White Transparent, while B.H. 10 (12) has given 3,015 lb and 4,120 lb., respectively, more than the two standards mentioned.

These would appear to be varieties of great promise, and the supremacy of B.6450, if for no other reason, seems threatened in the light of these new discoveries.

EDITORIAL NOTICES.

HEAD OFFICE — BARBADOS.

Letters and matter for publication, as well as all specimens for naming, should be addressed to the Commissioner, Imperial Department of Agriculture, Barbados.

All applications for copies of the 'Agricultural News' and other Departmental publications, should be addressed to the Agents' and not to the Department.

The complete list of Agents, and the subscription and advertisement rates, will be found on page 3 of the cover.

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Agricultural News

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NOTES AND COMMENTS.

Contents of Present Issue.

The editorial in this number deals with neglect of science by the daily Press.

A valuable article appears on page 404 which shows what would have been the experience had the canes dealt with in the Antigua Central Factory been dealt with under the old muscovado system.

A review of the Barbados Sugar-cane Experiment Report will be found on page 407.

The information under the headings Insect Notes, and Plants Diseases, consists of reviews of the subject-matter published in those sections of this Journal during the past year.

Teff—A Fodder Grass.

In this Journal for March 14, 1914 (page 85), a useful article appears on the subject of fodder grasses. Amongst those referred to is Teff (*Eragrostis abyssinica*). It is stated that Teff was introduced into the Transvaal in 1903 and has since proved itself a complete success, its qualities being good palatability, high nutritive value, heavy yielding, rapidly growing, drought resisting, and ability to smother weeds.

The Commissioner of Agriculture for the West Indies has recently obtained through the Department of Agriculture, Union of South Africa, a supply of seed of this grass, and small quantities have been distributed to the different islands, including Trinidad where, it is learnt from Professor Carmody, the plant has already been tried. It seems rather difficult to establish in Trinidad. This is probably due to inferior germination capacity, in which respect the present supply is also said to be poor. It is hoped however that enough plants may be raised to produce seed for future distribution. There is every reason to believe that if this new fodder can be successfully grown, it will be a great boon to stock owners in the Lesser Antilles.

Limes v. Lemons.

The editor of *Tropical Life* in the October issue of that journal calls attention to the excellent qualities of the fresh lime, and suggests that it might be more widely substituted in Europe for the lemon. Mention is made of an article by the Scientific Assistant on the Staff of the Imperial Department, which appeared in a recent issue of the *Bulletin of the Imperial Institute*, where it is stated that the lime, although smaller than the lemon, yields, weight for weight, a good deal more juice; and the article in *Tropical Life* continues: 'we are quite certain that since the cost of freight is an important item to be considered, a cubic foot of limes would give infinitely more home-made lemonade or limeade than a cubic foot of lemons would, while the cost per gallon would surely work out at a lower cost than when made from lemons with their thicker skins and often indifferent pulp or fleshy contents.'

It then goes on to suggest that if lime producers in the West Indies could bulk their output and employ one or two real live travellers who are experts in the Peninsula fruit trade, they would, after two or three years' canvassing permanently place limes in a domestic place of importance in Great Britain.

Though the above suggestion is a good one, it cannot be gainsaid that the keeping qualities of the lime is inferior to that of the lemon: this, however, would not necessarily be a disadvantage if the market arrangements were such as to ensure a moderately rapid sale. The lime is essentially a summer fruit, and if supplied during that period it would no doubt sell quickly enough.

By way of commenting on the suggestions of *Tropical Life*, a note in the *West India Committee Circular* points out that the absence of freight facilities and the heavy war rates are insuperable obstacles for the present; while in normal times the unwillingness of planters to damage their trees by gathering fruit in the Winter militates against the efforts to replace the lemon by the lime.

In conclusion we may repeat what we have already pointed in anothor issue that the recent gifts of West Indian limes to the hospitals in England and France will make the fruit much better known and may eventually lead to its adoption for many purposes in place of the lemon as soon as the shipping trade is normal again.

Effect of the War on Jamaica's Trade.

Colonial Reports—Annual, No. 860, constitutes the report on the Colony of Jamaica for the year 1914-15. From this it is seen that the abnormal conditions consequent upon the European war have very seriously affected the Colony. Shortage of shipping facilities have been the foremost factor in this connexion, affecting both the export of produce and the import trade. The one industry in the Colony which the war has materially benefited is the sugar industry, which has reaped the advantage due to the diminished output of beet sugar. The demand for cacao has been of benefit to growers of this product in enhancing prices. Dye-woods also have, to a limited extent, profited by the increased demand. The drought in the early part of 1914 resulted in a serious diminution both in the quality and quantity of the fruit produced in the banana industry. Seasonable weather, however, in the latter part of the year 1914 and early in 1915, gives promise of a much improved condition of affairs in this respect.

Upon the outbreak of war the small settlers were urged to plant increased quantities of foodstuffs in view of the expected rise in the cost of imported foods, and due to this precaution, and helped by good rains, there has been an ample supply of provisions, counteracting to some considerable extent the diminution of purchasing power brought about by the effects of the war. The steps taken upon the outbreak of the war and later by legislation, to prevent an unwarrantable increase in the price of imported food, has kept prices within reasonable limits, and have satisfactorily achieved the purpose. The tourists traffic to the island suffered seriously, and the falling off in the number of tourists was very marked.

Notwithstanding these drawbacks, the opinion is expressed that (the circumstances inevitable to the conditions arising from the war having been realized and dealt with), there is no need for serious anxiety as to the prospects for the future, except as to the provision of adequate shipping facilities for the island produce. It must be mentioned, however, in regard to the foregoing, that since this opinion was expressed, in August last, Jamaica was visited by a severe hurricane which did considerable damage to growing crops.

Agricultural Teaching in American Schools.

A new book entitled The Essentials of Agriculture, of which the author is President H.J. Walters, is reviewed in a recent issue of *Nature* by Dr. E.J. Russel. It is stated that the book is in favour of making agricultural teaching as local as possible, taking the whole neighbourhood as the laboratory, and drawing abundantly on local estates, gardens and forest land, and on recognized local experts for the apparatus and materials required. Attention is given especially to the subject of plant improvement, and to conservative policy in relation to soil management. Mention is made of enormous losses that occur in the course of utilizing artificial manures, and this seems to be general all-over the world. Dr. Russell concludes his review by stating 'the book brings home vividly to the reader the enormous part played by the experiment stations in the development of American agriculture. The advances made during the last forty years would appear incredible if they were not accomplished facts, and the book is so well written and so well illustrated that the student must see at once that the hope for the future lies in the close co-operation of farmers and experiment station investigators. Both in matter and in spirit it is entirely commendable.

Comparative Agricultural and Forestry Meteorology

The *Experiment Station Record* (Vol. XXXI, No. 5), referring to recent investigations undertaken in regard to (1) influence of forest cover on the temperature of the soil at different depths, (2) influence of the degree of forestation on the amount of rainfall, and (3) the influence of leafy and coniferous forest growth on the temperature and humidity of the air, says, the more important conclusions are that forest growth exerts a decided influence on diurnal variations in temperature of the air, the maximum being much lower and the minimum much higher than in the air of unforested areas. The influence on the temperature of the soil, however, is comparatively small and disappears entirely at a depth of 0·2 metre. Forest growth appears to have considerable influence on the frequency of rainfall, although little upon the amount. It appears to increase the number of rainy days, and to reduce the number of torrential rains. The absolute humidity is higher and the relative humidity is lower in the forest than in the open country on account of the lower temperature prevailing in the former. This is true to a greater extent in coniferous forests than in those of leafy growth, and is most pronounced during the period from April to October.

The Late Mr. E. T. Racker.

We have to announce with regret the death of Mr. E. T. Racker of Barbados. Mr. Racker has been associated with this Department in connexion with the printing of this Journal since its foundation in April 1902. Mr. Racker was well known in Barbados as proprietor and editor of the daily paper, the *Agricultural Reporter*.

INSECT NOTES.

SUMMARY OF ENTOMOLOGICAL INFORMATION DURING 1915.

In continuation of the custom which has prevailed for several years past, the information which has appeared in the *Agricultural News* during 1915 relating to insect and mite pests of crops and animals is briefly summarized in the following notes.

General entomological reports, which have been reviewed and summarized during the year, are those from Barbados, Porto Rico, Nigeria and Mauritius.

The pests of peas and beans have been considered in five numbers of this journal, and the pink boll worm of cotton has been the subject of three articles.

PESTS IN BARBADOS.

This information consisted of a review of the entomological portion of the Annual Report on the Barbados Department of Agriculture for the year ended March 31, 1914. The points of chief interest are the attacks of termites on sugar-cane, the old or ripening canes being attacked by what is supposed to be a species of Eutermes. The fumigation of the nests, and burning infested trash, stumps and other refuse, checked the attack. Trial was made of an ant-destroying machine, by means of which fumes of sulphur and arsenic were forced into the nests. Trials are also mentioned of the use of a lime-sulphur paint for killing scale insects on the trunks of trees. Directions for preparing the paint were given. Under the head of sugar-cane insects mention was made of the brown hard back *Phytalus smithi* and its parasite (*Tiphia parallela*), the root borer (*Diaprepes abbreviatus*) and of the Leeward Islands root borer (*Exophthalmus esuriens*) on page 286.

INSECTS OF PORTO RICO.

These notes on page 282, deal with Circular No. 6, 'Control of the Changa', issued by the Porto Rico Board of Commissioners of Agriculture and Bulletin No. 192 of the United States Department of Agriculture on the Insects affecting vegetable crops in Porto Rico.

In the former of these a satisfactory control of the mole cricket is described: it consists in the use of a poison bait, applied in a ring around the plant to be protected or scattered broadcast over the surface of the ground. The bait is made of low grade flour, 100 lb., Paris green $2\frac{1}{2}$ to 3 lb. thoroughly mixed together. Several insects affecting vegetable crops are mentioned, chief of which are the sweet potato weevil (*Cylas formicarius*), the Southern beet webworm (*Pachyzanchla bipunctalis*) which attacks the garden beans and sword bean, while the mole cricket is also mentioned as a serious pest.

PESTS OF MAURITIUS.

On page 10, the Insect Notes included a brief review of the insect pests in Mauritius in 1913 and notes on West Indian insects. In the former of these it is stated that the sugar-cane grub *Phytalus smithi* was not spreading, that the number collected in 1913 was 34 million against 15 million in 1912, that the increased captures were due to the higher price paid for the insects and to a more thorough knowledge of the habits of the beetle.

The lawn cutworm, for several years a serious pest, was successfully controlled by a kerosene mixture composed of 1 part by weight of common soap dissolved in 20 parts of water with 40 parts of kerosene thoroughly stirred in: to 24 parts of this is added 16 parts Phenyl or 12 parts Creoline. Applied in a 2 per cent. solution in water this mixture does not injure grass and may be used at the rate of 11 gallons per 80 square feet for the destruction of subterranean caterpillars and the larvae of the Oryctes beetle.

On the same page, the notes on West Indian Pests, are taken from the monthly circulars containing Items of Departmental Interest which are sent in to the Imperial Commissioner each month from the several islands.

NIGERIAN PESTS.

The report on agricultural pests in Nigeria, by W. A. Lamborn was reviewed in two numbers of the *Agricultural News* at pages 74 and 90. This report contained interesting accounts of the insect and mite pests of cotton, cacao and maize, with brief notes on the pests of certain miscellaneous plants.

PESTS OF PEAS AND BEANS.

On page 154, an article on pea and bean weevils gives an account of the weevils species of the genus Bruchus which attack the stored grain and refers to the leaf eating caterpillars and to those which bore into the growing tips of the plants. The article which appeared on page 218, referred to the Bruchus weevils and to a stem borer which had appeared in St. Vincent, a species of Cryptorhynchus. This borer was further dealt with by Mr. S. C. Harland of St. Vincent in a paper which was published in two parts, at pages 346 and 362. The bean leaf caterpillar in Florida was the subject of a note on page 26.

The bean weevils (*Bruchus chinensis* and others) infest the beans and peas in the field and develop in the stored grain. The ripened seeds should be fumigated with carbon bisulphide when they are stored and naphthalene used freely with the stored grain (page 154). The leaf-eating caterpillars (*Anticarsia* [Thermesia] *gemmatalis*) and *Laphygma frugiperda*, which is better known as a pest of maize, may be controlled fairly well by the use of arsenate of lead. The leaf roller (*Eudamus proteus*) may also be controlled by the same means.

The pests dealt with under the title Insect Pests of Lima Beans in St. Vincent, pages 346 and 363, are the Cryptorhynchus borer, the bean leaf roller, a leaf blotch miner and the bean caterpillar.

The stem borer was recorded in 1910 as a serious pest of Jerusalem pea at the Experiment Station in St. Vincent. It is now known that the borer attacks the Lima bean, cowpea, rounceval pea, Jerusalem pea, and the haricot or French bean, among the cultivated beans, and that the *Phaseolus semierectus* and *Vigna luteola*, two plants growing wild in St. Vincent, are also attacked.

The life-history of this serious pest has not been entirely worked out. Control measures include rotation of crops, the careful destruction of all old bean vines, hand collecting of the adult, and the destruction of its wild food plants.

The blotch leaf miner is a small fly probably a species of Agromyza. The larva, a small maggot, tunnels under the upper epidermis. No control measures are suggested. The leaf caterpillar is stated to be a new one, greenish in colour and possessing a leaf rolling habit. Arsenate of lead and starch, 1-30 dusted on the plants is recommended as a control measure.

PINK BOLL WORM.

Three articles dealing with this pest have appeared at pages 186, 202 and 250. The first two of these were preliminary notes and the information they contained was embodied in the third which gave a fairly complete account of the insect.

The pink boll worm (*Gelechia gossypiella*) is a serious pest of cotton which is known to occur in India, Ceylon, Burmah, Straits Settlements, Egypt, British East Africa, German East Africa, Nigeria, Sierra Leone, and the Hawaiian Islands. This insect in its larval form injures the cotton boll, often causing a loss of 50 per cent. of the bolls. The life cycle ordinarily occupies about fifty-four days but the larva is capable of living for long periods in the old bolls or inside cotton seed; in one instance this was as much as seven months. Living larvae have been found in cotton seed shipped from Egypt when examined in the United States. Preventive measures against the introduction of this pest include the prohibition of the importation of all old cotton seed from countries in which it is known to occur, the keeping of imported baled cotton for at least a year at some point north of the cotton belt before allowing it to be taken into a cotton growing area, and fumigation. In this connexion the notes on the fumigation of baled cotton in vacuum mentioned below will be of interest.

PESTS OF MISCELLANEOUS CROPS.

COCO-NUTS. The insect pests of coco-nuts were referred to in a review of the insect portion of Copeland's book on coco-nuts, on page 42. This is an interesting account of the pests of this plant in the Philippines and the islands of the Far East.

CACAO. An article on the pests of cacao on page 58 was a review of the chapters of van Hall's book on Cacao relating to the insect and other animal pests of that crop.

On page 314, cacao thrips are discussed in an abstract of a report of the Entomologist on a recent visit to Grenada. Here it is suggested that thrips instead of being a pest should be regarded as always indicating something wrong in the matter of soil or drainage or disease. Any considerable increase of thrips on cacao in Grenada should be taken as a warning that something is wrong with the trees.

SWEET POTATO. The insect notes on page 131 dealt with the sweet potato weevil (*Cylas formicarius*) which was at that time recorded from the Bahama Islands. It was formerly known to occur in many tropical countries, and in this part of the world it was recorded in Jamaica, Cuba and British Guiana. It may be mentioned that since that article appeared this insect had been recorded in Porto Rico (see Notes on Porto Insects, page 282). This is a serious pest and every effort should be made to prevent its introduction into the Lesser Antilles.

PAPAW. An article of considerable interest in view of the attempts that have been made to interest planters and small holders in the West Indies in the growth of papaws (*Carica Papaya*) or the production of papain is that on page 106 entitled, A Fruit Fly Attacking Papaw Fruits, by Messrs. Knab and Yothers. The insect is the papaw fruit fly (*Toxitrypana curvicauda*). The egg is inserted into nearly ripe fruits, by the adult female, the larvae occur at first in the central seed cavity of the fruit and later, when nearly full-grown, are found in the flesh of the fruit. The full-grown larva leaves the fruit, falls to the ground and pupates under a bit of rock or in the soil. This insect is known in Florida, Bahamas, Porto Rico and the Danish West Indies, and in Central and South America. It is a serious pest and has increased rapidly. It has threatened the future development of the papaw industry in Florida.

CASSAVA. A weevil boring in the stems of cassava has occurred at the Experiment Station, St. Vincent. This appears to be a species of the genus Cryptorhynchus which may become very troublesome. It is suggested that the cuttings for planting should be free from infection and that all stems from fields where the insect has occurred should be burned as soon as the crop is harvested. This note appeared at page 155.

INDIAN CORN. On page 186, a brief account of the corn ear worms was given. These are *Laphygma frugiperda* and *Heliothis obsoleta*. The control suggested depends on the use of powdered lead arsenate and Paris green. The use of starch in diluting these poisons for use on Indian corn is mentioned on page 362 in the note which will be summarized below.

GUINEA GRASS. An account of an outbreak of the guinea grass moth on guinea grass and Para grass in Barbados was given on page 186.

COTTON. Two articles dealing with cotton stainer have been published during the year: on page 234 an account of cotton stainers and stained cotton, and on page 314 Notes, on an Internal Boll Disease of Cotton Seed. These show the relation of cotton stainers to stained cotton, and to a disease of the cotton seed. A note on a cotton stainer trap and one on the cotton worm in the United States appear on pages 309 and 166, respectively.

SUGAR-CANE. A note appeared on page 266 giving an account of a caterpillar, probably *Laphygma frugiperda*, attacking sugar-cane in St. Lucia, and one on page 394 with regard to the effect of attacks of the root borer (*Diaprepes abbreviatus*) on sugar-cane grown for experimental purposes in Barbados.

ANTS. Three notes on ants have appeared during the year. One, page 330, sounds a warning as to the possibility of the acrobat ant becoming a pest of cacao in Grenada, another, page 378, gives notes on the control of ants which take away onion seed in St. Vincent, while the third, page 59, is a brief note on ants in the Botanic Gardens, Dominica.

LOCUSTS. The notes on locusts include a brief account of the outbreak of the South American migratory locust (*Schistocerca paranensis*) in Venezuela, and the threatened invasion of Trinidad, page 202, and an account of an outbreak of locusts in British Guiana, page 347.

JACK SPANIARDS. On page 298, an illustrated article entitled West Indian Wasps gave an account of several species of wasps and mentions their value as predators on insect pests, and also refers to a certain disease which attacks one or more species. On page 395, there is a note on Introducing the Jack Spaniard into St. Lucia.

SOIL-INHABITING GRUBS. This note on page 122 deals with the grubs of the root borers Diaprepes and Exophthalmus, and of the hard back Phytalus and Lachnosterna in the Lesser Antilles.

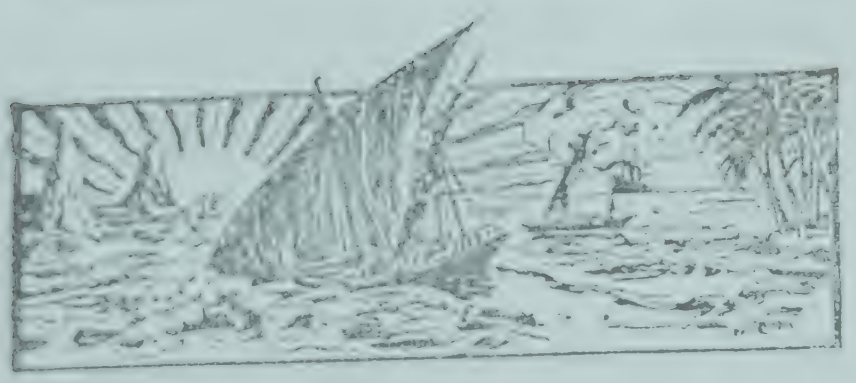
INSECTICIDES. On page 362 an interesting article entitled, Starch Instead of Lime with Paris Green, gives an account of experiments in St. Vincent which indicate that a low grade arrowroot starch 'Madingo' is much more satisfactory as a dilutent of Paris green and arsenate of lead than lime. The note on Cyanide of Potassium in trees shows that in certain trials in Barbados the introduction of cyanide into the body of certain woody plants resulted in the death of large patches of bark and wood.

FUMIGATION. Two brief notes on Fumigation, one on page 154 and the other on page 282, refer to trials of fumigation with cyanide of plant material in vacuum. This is of special interest in connexion with the attempts to fumigate baled cotton, and has reference particularly to the danger of the introduction of the pink boll worm in baled cotton.

QUARANTINE. On page 170 the Insect Notes deal with the difficulties of Plant Quarantine.

MISCELLANEOUS NOTES include the following: A Cricket Predaceous on Termities, page 202, Black blight and Snails, page 394. Fly larvae in horse manure, page 22, and the Animal pests of Hevea Rubber, page 23.

Notes on ticks are to be found on pages 59, 123 and 212.



GLEANINGS.

A letter has been received from Mr. C. Forbes Todd of Trinidad, formerly of St. Kitts, containing the sad news of the death of Major Montgommery, who was killed during October, in France. Major Montgommery was the owner of Molineux estate in St. Kitts, over which Mr. Todd was manager for a number of years.

The Grenada Department of Agriculture has recently issued a pamphlet on the lime and its cultivation, of which the object is to provide local planters with practical knowledge concerning this crop. In certain districts in Grenada where it is rather too dry for cacao, the cultivation of limes may be found a useful substitute.

It appears from the *Louisiana Planter* for October 9, that the reports that the sugar-cane crop in the Southern States was badly damaged by the Augnst hurricane had been to a great measure disproved by later advices. Nor has the damage to factories been considerable. It is added that the rain which accompanied the storm was of great benefit to the growing canes.

From a communication received from the Virgin Islands, it is learnt that nearly 50lb. of onion seed has been planted out in the Government nursery beds to provide seedlings for the peasants. The prospects before onion cultivation in the Virgin Islands are very promising. Recently an Onion Growers' Association was established, similar to the ones in Antigua and Montserrat.

Testing Grape Varieties in the Vinifera Regions of the United States, is the title of a bulky bulletin (No. 209) issued from the Bureau of Plant Industry by the United States Department of Agriculture. This shows that the best results are obtained where the scion and stock are congenial and both are suited to the conditions of the environment. The ideal vine is one having a most resistant root which is congenial to a top that produces the best fruit abundantly.

In the previous issue of the *Agricultural News* we referred to the duck as a mosquito destroyer. In connexion with this, a note in the *Review of Applied Entomology* (Series B: Medical and Veterinary) is of interest. When kept rather closely confined, there may be one disadvantage attaching to the value of ducks as mosquito destroyers. Where they are confined in yards of which the ground is rather moist, they often dig holes—sometimes to a depth of from 4 to 6 inches. These holes form admirable breeding places for mosquitoes and are frequently hidden by a partial or complete covering of grass.

Some interesting manurial experiments with cotton are described in the *Annual Report* of the experimental work on the Surat Agricultural Station, Bombay, for the year 1913-14. The object of one is to find out a suitable substitute for farmyard manure from the available indigenous resources. Six years' results show that farmyard manure which is getting more and more costly, can be very well replaced by such substances as rotted cactus, tankmud, town sweepings and pudrette. Another experiment concerns rotation crops with cotton. For this purpose ground nuts, pigeon peas and Jowár (*Andropogon sorghum*, var. *cernuus*) answer suitably.

Particulars are given in the *Monthly Magazine* of the Incorporated Chamber of Commerce of Liverpool for September 1915, as to the cacao exported from the Gold Coast in 1914 and 1915. During the period January to December 1914, there was exported 52,793 tons of cacao valued at £2,193,678. During the period January to June 1915, there was shipped 46,632 tons valued at £1,720,666. It will be observed that the quantity shipped for only six months during the present year was nearly as great as that shipped during the whole of 1914, which points to a big annual figure for 1915.

A review appears in the *Journal of the Royal Society of Arts* of a book called 'The Spirit of the Soil', by G. D. Knox, which is based upon Professor W. B. Bottomley's work on bacterized peat. It appears from this review that experts have now agreed that Professor Bottomley's methods are to be taken seriously, and it is further added that, although a popular writer, Mr. Knox has had a sound scientific training, and in spite of its somewhat poetical title, the volume under notice may be relied upon as 'an accurate exposition of a new development in agriculture and horticulture, which may have an important bearing on the national food supply.'

The Board of Trade Journal for October 14, 1915, states that the number of bales of cotton imported into the United Kingdom during the week ended October 7 was 38,034 (including 173 bales British West Indian, and 229 bales British West African), and the number imported during the forty weeks ended October 7, was 4,106,012 (including 4,620 bales British West Indian, 4,369 bales British West African, 17,379 bales British East African, and 979 bales foreign East Africa). The number of bales exported during the week ended October 7 was 4,979, and during the forty weeks 528,566.

The development of primary education in Pernambuco is exceedingly slow. The man of the coloured population can neither read nor write. Free education is certainly provided, and there are about 135 free schools with an average attendance of about fifty pupils, but, as neither clothes nor books are supplied, those who are too poor to buy them stay away. Secondary education of a high order is obtainable at a very moderate cost, and the children of the more prosperous and enlightened families are often extremely well informed and remarkably intelligent. The State of Pernambuco spends nearly 500,000 milreis per annum on primary education. (*Diplomatic and Consular Reports*, No. 5,412—Annual Series.)

THE SOILS OF ANTIGUA.

Dr. H. A. Tempany contributes to the current issue of the *West Indian Bulletin* a paper on the soils of Antigua, which is of particular interest on account of the wide diversity of soil types encountered within so small an area. The value of a general soil survey, such as this work of Dr. Tempany and others constitute, lies in the fact that it indicates on general lines the areas over which certain soil types prevail, thereby affording a rational insight into the problems in soil management confronting local agriculturists, and assisting them better to understand the position in that respect. It addition it affords a means of forming a judgment as to the suitability of the soils of different districts to different crops.

Physically the island of Antigua can be divided into three principal regions: (a) the central plain, (b) the north-eastern area, comprising the lime stone formation, (c) the south-western area, which is the most mountainous and the volcanic part of the island.

The soils of the central plain vary very considerably in character; near the limestone outcrop they may be markedly calcareous, but in the more central regions they are stiff and heavy, and require considerable artificial drainage; they are hard during dry weather, and are apt to become water-logged during wet seasons. They require liberal manuring and thorough tillage to maintain their tilth, while applications of lime are frequently of benefit. Departures from the prevalent type are of frequent occurrence owing to the geological outcrops which are very complex, consisting of limestone, beds of a flinty character and volcanic intrusion. In regard to the soils of the southern district (c), it is shown that all of them approximate fairly closely to one physical type, in which the larger and the smaller particles are nearly balanced. Characteristically they are, as a whole, of a decidedly desirable type, being easy to work, moderately retentive of water, and yet draining freely. The soils of the southern district are all non-calcareous; in general the majority of the cultivable lands in this area constitute a succession of valley bottoms of considerable extent, flanked by hills of moderate height, and in most cases sloping down very gently to the sea. Of late years there has been a decided tendency to exploit this area for the cultivation of cotton, limes and coco-nuts, with, on the whole, markedly successful results. The conditions are generally well adapted to coco-nut cultivation especially, and there is undoubtly room for considerable development in these and other directions.

In connexion with the survey of the soils of the limestone area (b), it is shown that in physical constitution they approximate very closely to a single soil type throughout, in which the particles of a fine silt and clay order of magnitude hold the preponderance by a large amount, and, on the average, constitute 65·9 per cent. of the soil. In relation to calcareous soils it is pointed out that their character will in actual practice be subject to profound modification in relation to the content of calcium carbonate. Soils which mechanical analysis show similar characteristics will differ markedly in their behaviour if a large proportion of calcium carbonate is present. This effect is due to the well-known phenomenon of flocculation. It is pointed out that in regard to the chemical characteristics of the soils of this area, apart from the content of calcium carbonate, no general classification is possible. These soils show a wide range in respect of organic matter and nitrogen content, and in this connexion it is laid down as a tentative generalization, that a content of 1·7 to 2·0 per cent. of organic carbon and 0·1 per cent. nitrogen serves as a rough indication of a satisfactory degree of fertility.

In conclusion it may be stated that Dr. Tempany's paper, which has been but briefly dealt with here, provides a large amount of statistical information in the form of tables, which will no doubt be consulted with interest by all those concerned with soils, especially by those living on the estates in the districts referred to. On account of its general interest we reproduce below a table showing the mean physical composition of the principal soil types encountered in Antigua.

TABLE SHOWING THE MEAN PHYSICAL COMPOSITION OF THE PRINCIPAL SOIL TYPES ENCOUNTERED IN ANTIGUA.*

	Type 1, mean of Nos. 1-19.	Type 2, mean of Nos. 20-25.	Type 3, mean of Nos. 26-34.	Type 4, mean of Nos. 36, 37, 42, 43 and 44.
	Per cent.	Per cent.	Per cent.	Per cent.
Stones	1·3	1·4	1·2	4·0
Coarse gravel	2·6	0·9	2·7	7·6
Gravel	2·3	2·0	2·9	5·9
Coarse sand ...	1·8	2·2	3·0	4·2
Medium sand	6·1	8·1	9·5	9·9
Fine sand ...	2·8	3·3	3·6	4·7
Very fine sand	3·5	3·7	4·0	4·3
Silt	6·6	5·1	5·3	9·8
Fine silt ...	58·0	63·4	46·4	38·4
Clay	8·2	4·1	13·4	4·6
Combined water and organic matter	8·2	6·3	7·9	7·1
	101·3	100·5	99·9	100·5
Calcium carbonate	26·2	5·6	0·43	0·64

	Type 5, mean of Nos. 38-40.	Type 6, No. 41.	Type 7, mean of Nos. 45-52
	Per cent.	Per cent.	Per cent.
Stones	0·5	...	1·5
Coarse gravel ...	1·0	...	10·1
Gravel	2·1	0·8	9·5
Coarse sand ...	1·7	20·0	5·1
Medium sand ...	3·2	31·8	14·9
Fine sand... ...	6·1	1·0	3·9
Very fine sand ...	8·4	2·8	7·7
Silt	12·2	2·6	9·4
Fine silt	50·9	30·4	26·4
Clay	6·9	5·2	5·1
Combined water and organic matter ...	6·9	5·4	5·8
	99·9	100·0	99·4
Calcium carbonate	0·07	0·03	0·23

* Limestone Area includes Types Nos. 1-19; Central Plain includes Types Nos. 20-44; Southern District includes Types Nos. 45-52.

PLANT DISEASES.

REVIEW OF INFORMATION CONCERNING PLANT DISEASES AND RELATED SUBJECTS.

In accordance with past custom there is given below a classified résumé of the articles and reviews which have appeared in this Journal under the headings Fungus Notes and Plant Diseases during the year 1915.

CITRUS TREES.

The outbreak of a citrus disease of unexampled severity in Florida and some other sections of the United States has been the subject of several notes as information has from time to time come through It is believed to have been introduced on stocks imported from Japan. It affects principally the leaves and twigs, and has received the name of Citrus Canker. It is specially severe on grape fruit, but attacks other citrus species and varieties to some extent. Exactly how serious it promises to be in its effects on oranges and limes does not appear in the information so far received. The first announcement as to the causative organism came from the Florida Experiment Station and was to the effect that the disease is due to a fungus of the genus Phyllosticta. Later work in the laboratory of the Bureau of Plant Industry produced convincing evidence that a bacterium, *Pseudomonas citri*, is the actual parasite. Special precautions against the introduction of this disease have been taken by the governments of the various West Indian Islands in which citrus industries exist, and the importance of the case calls for the willing co-operation of the general public with the officers charged with the duties of inspection of imported plants.

The notes referring to this subject appeared on pages 14, 46, 62, and 206.

Two reports dealing with the investigation of citrus diseases have been reviewed, one from Florida (p. 94), and the other from the Isle of Pines (p. 318). The former includes notes on the effect of Bordeaux mixture on die-back (of the type supposed to be due to physiological causes), on the artificial production of gummosis by means of various chemicals, and on the successful use of fungicides in preventing melanose.

The principal matters of interest in the Isle of Pines report concern wither-tip and die-back troubles. The former is attributed to a fungus which does not appear to be present in the Lesser Antilles, and is said to cause serious damage to the 'native lime'. The die-back is believed to be due to a species of Diplodia which is regarded as the most serious citrus enemy in the island. Besides die-back of large branches, it causes the only destructive rot of the mature fruit. This tends to confirm observations made by the present writer in Montserrat, a note as to which is given on the same page as the review. On page 334 the important question of the effects of exposure on lime trees is discussed, views on the subject being contributed by the principal agricultural officers of Dominica and St. Lucia. Instructed opinion is unanimous that efficient shelter is of the greatest importance in lime cultivation. Pamphlet No. 79 of the Imperial Department of Agriculture, dealing with the diseases of lime trees in forest districts in the West Indies (black root disease, red root disease, and pink disease) is reviewed on page 302.

COTTON.

The internal disease of cotton bolls is discussed in two articles on pages 222 and 238. This is an affection which has received most attention in Montserrat, but which occurs in Antigua, St. Vincent, the Virgin Islands, and probably in the other cotton-growing islands with the exception of Barbados. Bolls with an unblemished exterior are found while still unripe to contain rotted lint and swollen germinating seeds. A specific fungus is usually present, but its place in some instances is taken by a rod-shaped bacterium. Investigations in Montserrat, though not yet fully reported on, leave little room for doubt that the first cause of the injury is the puncturing of the wall of the boll by cotton stainer bugs. The method of infection which leads to the subsequent rot is not known.

MISCELLANEOUS CROPS.

An outline is given on page 30 of the information on diseases contained in two recent monographs on tropical cultivated plants: Professor Copeland's book on the coco-nut and Dr. van Hall's on cacao.

On page 46 appears a summary of a Michigan bulletin on two diseases of beans (*Phaseolus* spp.): anthracnose and bacterial blight. A disease of the latter type is common in the West Indies. No fully effective means of control is known.

The increased attention now being given to Indian corn in certain West Indian Islands prompted an article on the rust and smut diseases affecting the maize plant (p. 78). The occurrence of Brown Rust due to *Puccinia maydis*, Ber., in Montserrat is dealt with; it is not known to have been previously recorded from these islands. The corn smut due to *Ustilago Zeae*, Ung., is widely distributed in the West Indies, but appears never to assume epidemic form. *Puccinia purpurea*, Cke., is very common on sorghum, but does not appear to have been recorded locally as occurring on maize.

A preliminary note on a disease of the papaw tree, which does not seem to have been previously described, appears on page 174. It has been found occasionally in Barbados, and specimens have been received from Montserrat. It occurs on leaves and fruits, but is most serious in its effects on the stem, where it produces a localised rot which results in the death of the tree. It is apparently due to a species of Colletotrichum.

On the same page as the above is a note on cassava diseases in the West Indies, and a brief review of articles which deal with two root diseases of Hevea in Malaya.

A very serious bacterial disease of mangoes which has arisen and assumed epidemic form in South Africa is the subject of a note on page 302. It attacks the fruit and has proved capable of destroying the whole crop of an orchard. No remedial measures as yet tried have proved effective in controlling the disease.

A review of a report on a visit to Java (page 287)contains a reference to an exceedingly interesting piece of evidence regarding specific resistance to plant disease. Arabian coffee has been replaced in Java and elsewhere by the Liberian species, owing to the immunity of the latter to the notorious coffee rust. But although this quality was quite definite for some years, and is still retained against the rust as it exists in other countries, the fungus in Java appears to have adapted itself to the newer host, and now affects it with approximately equal virulence. No other interpretation of the facts seems to be possible. It is a now familiar fact that in the case of certain rusts the fungus which attacks a species A of the host genus and cannot be directly transferred to another species C,

may be indirectly transferred to it after a sojourn on an intermediate species B. Possibly the Java occurrence may be explicable on similar lines.

FUNGICIDES AND SPRAYING.

An interesting instance of the effect of lime in increasing resistance to disease in certain plants is given on page 270.

On the same page is recorded the spraying of diseased palm trees in India, successful in spite of the great height of the trees and the torrential rains. Use was made of Bordeaux mixture containing resin soap, applied by means of light compressed-air sprayers.

A further report on experiments in the use of Bordeaux mixture against leaf rust of ground nuts in Montserrat appears on page 350. Good results were again obtained.

The use of Burgundy mixture in substitution for Bordeaux mixture, especially where good quicklime is difficult to obtain, is advocated on page 398, where also instructions are given for its preparation.

FUNGOUS CONTROL OF INSECT PESTS.

Information on this subject has been given in several notes and reviews. An article on the subject of the efficiency of fungus parasites of scale insects in the Lesser Antilles appears on pages 110 and 126. It is pointed out that their distribution and efficiency depends on the degree of humidity, and that attempts at artificial dissimination can only be successful if this is taken fully into account. There is some scope for artificial methods in affording the fungi a good start at the beginning of the wet season, and in the provision of shelter to conserve the humidity of the air. The conclusions reached in the West Indies are borne out by experience in Florida and California, concerning which notes appear on pages 94 and 286.

A list of the numerous entomogenous fungi of Porto Rico and notes as to their hosts are given on page 286 in a review of a useful bulletin from that island. The discovery of the perithecial fructifications of Aschersonia in Grenada and Trinidad by Dr. Thaxter is noted on page 14.

An account of an investigation of a bacterial disease of Lachnosterna grubs is reviewed on page 142. The results were not conclusive as to the existence of a fatal disease of this nature.

W. N.

WEST INDIAN PRODUCTS.

DRUGS AND SPICES IN THE LONDON MARKET.

Mr. J. R. Jackson, A.L.S., has forwarded the following report on the London drug and spice markets for the month of October:—

Throughout the month of October there has been a fair amount of business transacted at the drug and spice auctions, with very slight fluctuations in supply and demand. With regard to values of individual products, citric acid, kola, mace, sarsaparilla, and lime juice have all had a tendency to decline, while Cassia Fistula has advanced.

GINGER, MACE AND NUTMEGS.

For ginger there has been very small supplies with a very limited demand. At auction on the 27th, the offerings amounted only to 180 bags of wormy washed rough Cochin, all of which were brought in at 26*s.* per cwt. Mace was represented at the first auction on the 13th, by 27 packages of West Indian, 14 of which sold, good bold pale fetching 1*s.* 10*d.* to 2*s.* per lb., pale broken 1. 8*d.*, and common broken 7*d.* to 8½*d.* On the 20th, 93 packages of West Indian were offered, and about half sold at the following rates: 1*s.* 9*d.* to 1*s.* 10*d.* for fair palish, 1*s.* 6*d.* to 1*s.* 7*d.* for fair to good reddish, 1*s.* 4*d.* for red, and 1*s.* 2*d.* for inferior red, while broken fetched 6½*d.* to 8*d.* per lb. On the 27th, 194 packages of West Indian were brought forward and sold, 1*s.* 7*d.* to 7*s.* 10*d.* being paid for fair to good pale; ordinary to fair mixed fetched 1*s.* 3*d.* to 1*s.* 6*d.*, and common 1*s.* 1*d.* to 1*s.* 2*d.*

Nutmegs were well represented at auction on the 20th, when as many as 240 packages of West Indian were offered and sold, 65's fetching 1*s.* 2*d.*, 67's 11½*d.*, and 90's to 99's 4½*d.* to 5¼*d.* Again on the 27th, a large consignment was brought forward, numbering 634 packages of West Indian, all of which sold at steady rates, 65's to 80's being 1*d.* dearer.

SARSAPARILLA.

The month opened with very large supplies of this drug. At auction on the 7th, the offerings were as follows: Grey Jamaica 52 bales, native Jamaica 19, Honduras 49. Of these, 46 bales of the grey Jamaica were disposed of at the following rates: ordinary part coarse to good fibrous 1*s.* 7*d.* to 1*s.* 9*d.*, and 1*s.* 4*d.* for coarse and dark. Of the native Jamaica only 1 bale was sold, fetching 11*d.* per lb. for red, press packed; none of the Honduras was disposed of, being bought in at from 1*s.* 6*d.* to 1*s.* 10*d.* Quite at the end of the month it was reported that sales had been effected privately of good fibrous grey Jamaica at 1*s.* 10*d.*, and Lima-Jamaica at 1*s.* 7*d.* to 1*s.* 8*d.* per lb.

CITRIC ACID, CANELLA ALBA, CASHEW NUTS, CASSIA FISTULA, KOLA, LIME OIL, LIME JUICE, TAMARINDS, AND ARROWROOT.

Citric acid was in very little demand at the beginning of the month, the quotation being from 3*s.* to 3*s.* 1*d.* per lb., a position which it retained with a slightly increased demand towards the end. At the first drug auction on the 7th, 3 packages of Canella alba bark were offered but found no buyers. Sixty-one packages of cashew nuts were also offered with a similar result On the other hand, 12 bags of bold, but partly wormy Cassia Fistula pods from Dominica realized 41*s.* per cwt. There was a very large supply of Kola nuts brought forward at the auction on October 7, 151 packages being offered, only 3 of which sold at 4¾*d.* per lb. for part mouldy Ceylon, and 7*d.* for West Indian halves. At the concluding auction on the 28th, 4*d.* per lb. was paid for 3 packages of green West Indian halves. Lime oil was represented at the first auction by 1 case of West Indian distilled, which was sold at 7*s.* 6*d.* per lb. At the close of the month, 8*s.* was asked for prompt delivery of the same quality oil. With regard to lime juice, it was stated towards the end of the month, that in consequence of recent arrivals West Indian could be quoted at from 3*s.* 2*d.* upward. At the first auction on the 7th of the month, West Indian tamarinds were in good supply, as many as 72 packages being offered, but no sales were effected. St. Vincent arrowroot was in large supply at auction on the 14th, as many as 300 barrels being brought forward, and sold at 2$\frac{1}{16}$*d.* per lb.

MARKET REPORTS.

London.—THE WEST INDIA COMMITTEE CIRCULAR, November 16, 1915.

ARROWROOT—2½*d.* to 4¾*d.*
BALATA—Sheet 2*s.* 4¼*d.*; block 1*s.* 10¾*d.* to 1*s.* 11*d.*
BEESWAX—No quotations.
CACAO—Trinidad, 84/6 to 86/- per cwt.; Grenada, 87/6; Jamaica, 85/6 to 93/.
COFFEE—Jamaica, 51/- to 52/- per cwt.
COPRA—£29 to £29 10*s.* per ton.
COTTON—Fully Fine no quotations; Floridas, no quotations; West Indian Sea Island, 14*d.* to 28*d.*
FRUIT—No quotations.
FUSTIC—£6 to £7.
GINGER—Jamaica, 58/- to 80/-.
ISINGLASS—No quotations.
HONEY—29/- to 39/- per cwt.
LIME JUICE—Raw, 2/6; concentrated, £25; Otto of limes (hand-pressed), no quotations.
LOGWOOD—£8 to £9.
MACE—6*d.* to 2/4*d.*
NUTMEGS—4¼*d.* to 8*d.*
PIMENTO—2½*d.*
RUBBER—Para, fine hard, 2/8; fine soft, 2/6½; Castilloa, 2/4.
RUM—Jamaica, 4/4 to 5/3

New York.—Messrs. GILLESPIE BROS. & Co., November 17, 1915.

CACAO—Caracas, 20½c. to 21c.; Grenada, 19½c. to 20c.; Trinidad, 20¼c. to 20½c.; Jamaica, 18c. to 18½c.
COCO-NUTS—Jamaica and Trinidad selects, $40·00 to $42·00; culls, $25·00 to $26·00.
COFFEE—Jamaica, 8½c. to 12c. per lb.
GINGER—14½c. to 17c. per lb.
GOAT SKINS—Jamaica, 45c.; Antigua and Barbados, 43c. to 45c.; St. Thomas and St. Kitts, 42c. to 44c. per lb.
GRAPE FRUIT—Jamaica, $2·75 to $4·00.
LIMES—$4·50.
MACE—36c. to 44c. per lb.
NUTMEGS—12c. to 12½c.
ORANGES—Jamaica, $2·00 to $3·00.
PIMENTO—3½c. to 4c. per lb.
SUGAR—Centrifugals, 96°, 5·02c.; Muscovados, 89°, 4·40c.; Molasses, 89°, 4·24c., all duty paid.

Trinidad.—Messrs. GORDON, GRANT & Co., November 29, 1915.

CACAO—Venezuelan, $17·50 to $18·00; Trinidad, $17·50 to $19·00.
COCO-NUT OIL—87c. per Imperial gallon.
COFFEE—Venezuelan, 14c. per lb.
COPRA—$5·00 to per 100 lb.
DHAL—$6·25.
ONIONS—$4·00 to $4·50 per 100 lb.
PEAS, SPLIT—$9·00 per bag.
POTATOES—English $2·00 to $2·25 per 100 lb.
RICE—Yellow, $6·00 to $6·25; White, $6·00 to $6·25 per bag.
SUGAR—American crushed, no quotations.

Barbados.—Messrs. JAMES A. LYNCH & Co., Ltd., October 30, 1915; T. S. GARRAWAY & Co., November 2, 1915.

ARROWROOT—$4·50 to $4·60 per 100 lb.
CACAO—$15·00 to $16·00 per 100 lb.
COCO-NUTS—$20·00 husked nuts.
HAY—$1·70 to $1·90 per 100 lb.
MANURES—Nitrate of soda, no quotations; Cacao manure, no quotations; Sulphate of ammonia, $85·00 to $95·00 per ton.
MOLASSES—No quotations.
ONIONS—$7·00 to $10·00 per 190 lb.
PEAS, SPLIT—$10·00 to $12·50 per 210 lb.; Canada, $5·40 per 120 lb.
POTATOES—Nova Scotia, $4·87 to $5·00 per 160 lb.
RICE—Ballam, $6·00 to $6·10 per 190 lb.; Patna, no quotations; Rangoon, no quotations.
SUGAR—Muscovado centrifugals, $3·60 to $4·25.

British Guiana.—Messrs. WIETING & RICHTER, November 13, 1915; Messrs. SANDBACH, PARKER & Co., November 26, 1915.

ARTICLES.	Messrs. WIETING & RICHTER.	Messrs. SANDBACH, PARKER & Co.
ARROWROOT—St. Vincent	——	——
BALATA—Venezuela block	——	——
Demerara sheet	——	——
CACAO—Native	15c. per lb.	21c. per lb.
CASSAVA—	$1·20	——
CASSAVA STARCH—	$10 to $11	——
COCO-NUTS—	$10 to $15 per M.	$18 per M.
COFFEE—Creole	12c. to 13c.	14c. per lb.
Jamaica and Rio	14c. to 15c. per lb.	14c.
Liberian	——	10c. per lb.
DHAL—	$6·00	$7·50
Green Dhal	——	——
EDDOES—	$1·44	——
MOLASSES—Yellow	None	——
ONIONS—Teneriffe	——	——
Madeira	——	7c.
PEAS—Split	$12·00 to $12·50	$12·00
Marseilles	——	per bag. (210 lb.)
PLANTAINS—	16c. to 40c.	——
POTATOES—Nova Scotia	$4·00 to $4·25	$4·50
Lisbon	——	——
POTATOES—Sweet, B'bados	$1·68	——
RICE—Ballam	No quotation	——
Creolé	$5·25 to $5·50	$5·50
TANNIAS—	$2·64	——
YAMS—White	$2·88	——
Buck	$3·12	——
SUGAR—Dark crystals	$3·50 to $3·70	$3·75
Yellow	$4·25 to $4·35	$4·25
White	——	——
Molasses	$3·10	——
TIMBER—GREENHEART	32c. to 55c. per cub. foot	32c. to 55c. per cub. foot
Wallaba shingles	$4·00 to $6·25 per M.	$4·00 to $6·00 per M.
,, Cordwood	$1·80 to $2·00 per ton	——